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ABSTRACT

This publication is intended to provide teachers with ideas and strategies for using one computer in the classroom. The focus is on elementary school classes, but some activities can be used with older students. Recurring themes are: scaffolding learning, "crap" detection or critical thinking, and knowledge organizing. Chapter 1: "Classroom Management" addresses issues related to handling classroom management decisions, using a computer for record keeping, choosing hardware and software, and dealing with technical issues; Chapter 2: "Ideas for Using Integrated Packages" describes word processing, database, and spreadsheet activities possible with only one computer; Chapter 3: "Knowledge Organizers" covers software that helps teachers and students make sense of isolated information; and Chapter 4: "Teaching With One Computer in the Content Areas" examines software formats and packages for teaching specific content. Five appendixes provide: a sample keyboard diagram, a worksheet for creating a ClarisWorks database, basic information on useful software packages, contact information for software publishers and other resources, and contact information for national educational software distributors. (Includes index.) (DLS)

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Jessica Kahn began her teaching career as a fourth-grade teacher in inner-city Philadelphia, and received her master's degree in education from Temple University. She received her doctorate in educational leadership/computers in curriculum (a program she designed) from the Graduate School of Education at the University of Pennsylvania. Her dissertation described how second and third graders learned word processing and how they used it in their school-sponsored writing. She is a coauthor, with Marilyn Cochran-Smith and Cynthia Paris, of "Learning to Write Differently: Teachers and Children Using Word Processing," which won the 1992 CEE Richard A. Meade Award for distinguished research in English education from the National Council of Teachers of English.

Dr. Kahn has been teaching graduate courses in educational technology since 1985 throughout southeastern Pennsylvania and New Jersey. She is currently Associate Professor of Technology in Education at Chestnut Hill College in Philadelphia, Pennsylvania, where she teaches undergraduate and graduate courses on the integration of technology in education. She also directs a master's program in applied technology with reading certification.

Dr. Kahn writes a monthly column, "I Only Have One Computer," for *Interface*, the technology newsletter of the Montgomery County Intermediate Unit, Norristown, Pennsylvania. She has also contributed articles to *Learning & Leading With Technology* and other national publications.

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Introduction

The idea for this book stems from a monthly column I write for *Interface*, the technology newsletter of the Montgomery County, Pennsylvania, Intermediate Unit. In that column, I suggest ways to integrate the use of one computer into the curriculum: classroom management strategies, hardware and software selection, record-keeping mechanisms, and activities on a variety of topics for many age groups. Some of these ideas are my own and are based on what I have done with students in several settings. Others come from my graduate students in the master's program in applied technology at Chestnut Hill College.

Learning & Leading With Technology (L&L) has also used some of my work in a regular column entitled "The One-Computer Classroom," edited by Richard Dillon. Thus, some of the material in the book may seem familiar to readers of *Interface* and *L&L*.

My first teaching job was in a fourth-grade classroom, and that is the classroom reality I know best. This book therefore focuses on one-computer classrooms in elementary schools, but some of the activities surely can be used with older students, perhaps through the high school level. Many of the ideas (especially those concerning the selection of software and hardware, classroom management, and record keeping) are valuable for teachers of any grade. I have tried not only to discuss software and hardware in generic terms and to highlight features and selection criteria that enable teachers to use one computer for educationally valuable activities, but also to illustrate the points with specifics from particular software. If you are not familiar with a piece of software I mention, this book will perhaps pique your curiosity but you may need other support to handle the nuts and bolts of that software.

Several themes recur throughout this book. They are powerful ideas that provide me with ways to think about the processes of teaching and learning. The first is the concept of *scaffolding* learning, from Bruner (1978). The second is the notion of *crap detection*, presented by Postman and Weingartner (1969). The third is the computer as *knowledge organizer*, a phrase I think I invented.

Scaffolding is the process that parents almost instinctively use when they read to their children, providing as much help and support as needed in the beginning, explaining words and pictures, asking "what do you think will happen next?," and gradually withdrawing that support as their children begin to pick out words and phrases on their own, until they can read independently. I use the scaffolding idea in two different ways. First, I argue that teachers must scaffold tasks, especially at a computer, so that their students have all the support they need as they start to use a computer. This sort of support will gradually become unnecessary; however, it is critically important in the beginning. I also make the related point that computer software scaffolds students' learning; for example, it can help students learn numbers with multisensory prompts, model left-to-right and top-to-bottom progression in writing, illustrate the distances between planets, and so forth. Quality software does this accurately and appropriately.

Crap detection is the ability to recognize bogus claims, bad information, unfounded theory, and faulty reasoning. None of us needs access to more information. We have enough. We need to be crap detectors, which is perhaps only an inelegant euphemism for "critical thinkers." Teachers must exercise sound judgment concerning the curriculum and instruction in their classrooms, sifting through the noise and the pollution to get to the worthwhile stuff. And I would argue with Postman and Weingartner (1969) that our job is to teach students to be crap detectors as well. Information about technology—and mediated by technology—abounds. Our students must be able to recognize the solid information and ignore the hyperbole.

Knowledge organizing is how I think computers are uniquely equipped to help students. Computers organize information in typically cybernetic ways, and our students need to understand the logic of Venn diagrams and the structures involved in sorting and storing information. Humans organize knowledge and create meaningful connections. Software for creating timelines and concept maps facilitates that process. CD-ROM resources, e.g., encyclopedias, thesauruses, and atlases, have been created with some of these connections specified by the programmer. Still other resources (e.g., *Voices of the '30s*) enable students to construct connections. The ability to organize knowledge—either the computer's or the student's with the computer—is a theme I visit repeatedly.

This book contains chapters on four related topics: teachers' issues, ideas for using integrated packages in the one-computer classroom, knowledge organizers, and content area activities. The first chapter addresses issues related to handling classroom management decisions, using a computer for record keeping, making decisions about hardware and software, and dealing with unique technical issues, such as keyboarding and citing Internet sources. The second chapter describes word processing, database, and spreadsheet activities you can do with only one computer. The third chapter is about knowledge organizers, those pieces of software that help teachers and students make sense of isolated information. The fourth chapter examines software formats and packages for teaching specific content.

This book is written with the belief that you are a competent teacher and know what works best with your students. I can offer suggestions and ideas, and I can tell you what has worked for me or for other teachers I know. But every classroom is a unique culture and every teacher is an independent artist. Take whatever appeals to you in this book and try it. Let me know what works, what adaptations and improvements you have made, and what other activities you have tried. I look forward to hearing from you. My e-mail address is jkahn@mciunix.mciu.k12.pa.us.

Chapter 1

Classroom Management

The distribution of computers within a school is critical. What you do with them depends on where they are and how often kids can use them. As each school district grapples with questions of security, economics, and (hopefully) staff development, the inevitable question arises—all computers in a lab or one computer in each classroom? If your school district has answered that question by scattering computers in individual classrooms, this book is for you.

One computer is a lonely machine when the teacher's goal is to have everyone write with word processing. Keyboarding cannot be taught efficiently in the one-computer classroom (more on this later). But neat things can be done with just one computer—things that actually work better with only one computer. You may already know some of them, but perhaps this book can offer you some new ideas or provide guidelines for thinking about using one computer. If you have two computers, this book will be twice as valuable. You can run two of these activities at once or do the same activity on two computers in half the time.

"I Have Only One Computer"

Teachers often tell me that their one computer is used mainly for enrichment, for students who finish their assigned work early and need to occupy themselves while the rest of the class is still working. However, we can do more than that with one computer in a classroom. With a little attention to detail, teachers can help students understand that computer use is part of the curriculum.

This chapter will describe ways to use one computer with the whole class and ways to organize computer use by small groups or individuals. Suggestions for record-keeping activities will help your students understand that their work at the computer counts and that it supports your curricular goals. Think about your curriculum and ask yourself what has not worked as well as you had hoped. (There is no point in fixing the lessons that aren't "broken.") Consider whether a computer could provide some support in this area. Then go ahead and try something. If you aren't so thrilled with the way things are happening, maybe a computer will help you improve in this area.

The intent of this chapter is to provide ideas for computer-related activities. These activities might include multiple demonstrations, the use of reference materials at the computer, structured lessons with time or content limits, and the use of designated helpers from among the class members.

Do you need to do all this? Possibly not, but if you overteach and overorganize at first, you will avoid some problems and wasted time when students work at the computer on their own. With only one computer in your classroom, you cannot afford to waste time.

Managing Software Instruction

You can use the computer with the whole group, provided you have the demonstration hardware to make that feasible. (See the discussion on monitors and projection devices in the section entitled "One Computer and the Whole Class at Once.") Or you can preteach to the whole group before sending students to the computer in pairs or singly as the rest of the class works on something else. But if students are working at the computer while you are trying to work elsewhere in the classroom, you need to create a self-sustaining environment at the computer so that you are not interrupted every five minutes.

For example, you may expect students to learn to use a piece of software from a single whole-group demonstration. You may expect that, but it probably will not happen. It has never happened for me, even when I have taught highly intelligent, motivated adults. One way to approach this problem is to provide reminders about software use at the computer. These reminders should be accompanied by a sheet of instructions in a binder, identified by program and protected by a plastic cover. The sheet should describe how to open, use, quit, and save work in the application. All this sounds like a lot of effort, but it will save you from interruptions—and once you've created these materials you will have them forever. Here, for instance, is an example of an instruction sheet for the program *Timeliner*.

Working With Timeliner

1. To begin, open the Timeliner folder and click the Timeliner icon—it looks like a lopsided alarm clock.
2. If you have done this correctly, the menu bar should include the following menus: File, Edit, View, Format, Toolbox.

3. The title screen will appear. If you are creating a new timeline, click New under the File menu. If you are adding to a class timeline, click Open under the File menu.
4. To add a date and the event that goes with it, choose New Event under the Toolbox menu. You can change the event by using Edit Event in the Toolbox menu.
5. To sort and view all the dates on the timeline, choose Data from the View menu.
6. To see all the dates listed from earliest to most recent, choose List from the View menu.
7. To see all the dates in a compacted banner, choose Compact from the View menu.
8. To see all the dates in a larger banner, choose Banner from the View menu.

Managing Time Constraints

Limit your students' time at the computer to ensure that each student has an equal amount of time. Design your assignments for specific amounts of computer time. Be clear about how long students should work and what they should accomplish. Arranging for a steady stream of computer users may be tricky. At first, you can simply schedule students and have everybody sign in and out. It sounds elaborate, but it works. You can ease up later and just let it happen, but you probably should not start this way. Here is an example of a short assignment sheet for *Where in the World Is Carmen Sandiego?*

Week of October 1st—Where in the World Is Carmen Sandiego?

Sign in at the computer in pairs and solve at least one case. You may work for no more than 20 minutes.

Criminal ______________________________

Crime ______________________________

Description of the criminal ______________________

Record one new fact in your journal.

Identify one new vocabulary word and define it.

To avoid having students interrupt you with computer problems, you can preteach a piece of software to several students, either at recess or at lunch time. These students then become the resident experts for this piece of software. Then you can institute the rule "Ask three before me," which means that students may not disturb you until they have tried unsuccessfully to solve their problem by asking each of the three student experts. This, of course, assumes that the experts are working on something that can be interrupted for a moment. Also, if you use pairs of students rather than individuals, they can support each other. Understand that they will probably have to talk to each other, and do not be surprised if you hear a steady stream of chatter. This kind of conversation is probably more educational than the software itself.

We have all had some students whose academic performance was so shaky that we hated to excuse them from any activity. But if you have chosen a computer activity that you think is important and valuable, you can send pairs of students to the computer secure in the knowledge that they are not missing out on something else but rather are doing their necessary work at the computer.

An administrator once told me that to persuade the school board to spend money on technology, he had to show board members that teachers used the technology they already had. He said he needed to demonstrate that he had a "critical mass" of computer-using educators. (That's us!) Make the computer a part of your instructional day rather than something to use after the real work is done. With some planning and structure, students can do meaningful work at the computer that supports and extends the rest of your classroom activities.

Using Computer Journals

You have one computer, which students will use either alone, in pairs, or in small groups, without your supervision. But how do you keep students focused and on task? How do you ensure that they remember what they have done so that they can do it again next time? How do you help them make the most of their computer time? It's easy: use computer journals.

These journals can be loose-leaf notebooks, small copybooks, or 3" x 5" cards in a metal box. Whatever record-keeping materials are around can probably be adapted for this job. Look around the supply closet and see what you find. It will probably work. The point is that every time students go to the computer, they understand that they must somehow document their activities.

First, you can have a weekly check-in/check-out time chart attached to the computer. Students sign in when they begin to work and sign out when they are done. This avoids arguments about who has been to the computer least or most often. Also, whenever students go to the computer they can record what they did in their journals. You will then have some sense of their activities at the computer along with the occasional printout of a word-processing file.

What goes in the journal? There are at least five categories of information your students can include in their journals.

Computer-Related Information

"How-to" material, such as how to save a file, how to change the name of a file, how to change the font for an entire document, and how to add a field to a database, can be a valuable addition to computer journals. Students can enter in their journals any computer-related information they used and might need again, especially if they had to request it from someone else. In this way, they accumulate information about the computer and the software and will have it when they need it again. This also tells you what students need to know and perhaps will tell you how to edit your instruction sheets to clear up misunderstandings or fill in gaps.

Vocabulary

Students can also record any new vocabulary words they discover while using the software. This may include computer terms like "glossary" or "repaginate." These words can be entered along with a brief description of what happened when students used these features. Vocabulary words may also be found within the content of the software, for example, "canopy" in *Field Trip to the Rainforest* or "tessellation" in *Tesselmania!*. If the software warrants it, you can require that every student bring back to the rest of the class two new words with either a dictionary definition or the student's best guess from the context. In the large-group discussion, you can use chart paper to build a list of new vocabulary words, perhaps with brief definitions.

Questions

The journal can also be used to record questions that arise during your students' working sessions. These questions might be about procedures for using software or about its content. Allow time, either at the end of the morning or at the end of the day, for addressing these questions. Most questions will not be unique to one student; several students will probably have the same question, although perhaps only one student will have actually recorded it. In any case, all of the students will need the answer. The large-group discussion of questions can clear up confusion.

Addresses

Another good use of the computer journal is for recording Internet and World Wide Web addresses, as well as the content accessed with the addresses. This is especially true for Web site addresses, which appear in Netscape at the top of the screen and may be arrived at circuitously. To save time on your one computer, students need to be able to efficiently navigate telecommunications land. (More about this later.) Because most Internet addresses are remarkably intricate and difficult to remember, have students enter them in their journals. You can create bookmarks for particular sites, but your students should not be encouraged to create endless bookmarks.

Strategies

Journals can be used to record game strategies or clues. Students who play one of the *Where in the World Is Carmen Sandiego?* games can record information they discover while using an atlas or almanac. Even young students can record new words on index cards, which can be kept in a box and used for writing, alphabetizing, and so forth. Again, take time to have a large-group discussion of what was learned at the computer, thus underscoring the value of what happens in each small group as students work through a piece of software. Students who understand that they are required to keep some sort of record will realize that the activity really counts.

One Computer and the Whole Class at Once

How can you use the computer with your whole class at once? You will certainly need a projection device. Most computer screens are too small to be seen by more than three or four students at once. To facilitate working with the whole class, you will need either a larger display monitor (like the one hooked up to your school's VCRs), a liquid crystal display (LCD) panel on an overhead projector, or a video projector. In all these cases, the projection device and the computer need to be positioned to minimize glare, to connect without danger of the cables tripping someone, and to allow you to see the class and the computer image simultaneously.

TV monitors must be properly cabled to allow the computer image to be displayed, and for this you will need clear instructions from your district's "techie." Better yet, all cords and cables should be clearly marked with gummed labels, indicating where they should be plugged in. The TV monitor should be securely mounted on a high cart for easy viewing. It is helpful if the image appears both on the TV monitor and on the computer monitor because you will have to use the keyboard and the mouse to navigate the software. If there is no district "techie" to solve this problem, you may have to solve it yourself. Electronics stores are great places to start gathering information.

LCD panels are smaller, lighter, more maneuverable, and more expensive than TV monitors. They were created to enable the user to project an image on the wall, where larger groups can see it clearly. This requires both a room that can be darkened almost completely and a very bright overhead projector. (You need a minimum rating of 4,000 lumens, the measurement of brightness.) Like the TV monitor, the LCD panel must be cabled to the computer. Essentially, a cable feeds the video information from the computer to the LCD panel, and, on some LCD panels, a second cable feeds the video information to the computer monitor. There is also a power cable that connects the LCD panel to a power source. That means that the LCD panel will work only if it is connected both to the computer and to a power source. A separate cable may be required to enable you to see an image on the computer as the image is projected on the wall. Some old LCD panels do not display in color; these are no longer very useful.

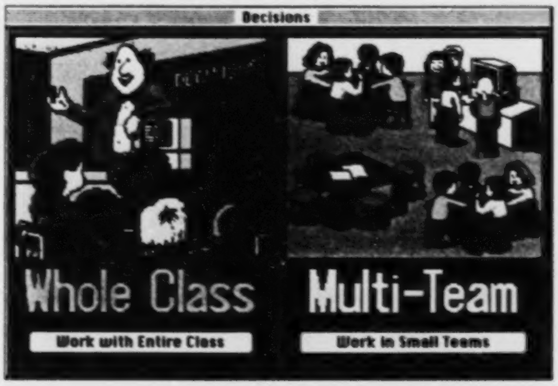
Video projectors link directly to the computer and eliminate the need for an overhead projector. They project high-quality, brightly illuminated images directly from the computer onto a wall. The hitch, of course, is that they are new and more expensive than LCD panels. The price will probably come down in the next few years (every technology price seems to), and when it does, this may be the way to go. Good sources of information about these devices are catalogues of computer equipment (e.g., MacWarehouse, MicroWarehouse) and stores that specialize in multimedia equipment or video equipment. Make some phone calls and be clear about what you want to do, and do not let anyone swamp you with "techie" vocabulary.

Bear in mind that you probably want the most adaptable, most versatile, and newest technology you can afford. Cheaper is not necessarily better. One problem with LCD panels is that they require a very powerful overhead projector, and another consideration is their portability, which makes them easy to steal. Video projectors stand alone and are more difficult to steal. Another consideration is how the projection device connects to the computer. Some computers (e.g., Performas) do not have separate monitors and therefore will require a "video out" card to connect to an LCD device.

Using the Display Device

So what do you do with this display device once you have it? First, you will probably have to share it with other teachers, so try to schedule carefully so that it is there when you want it. Then you want to display something that lends itself either to a whole-class demonstration or to team game-playing. Demonstrating how to use a piece of software can be valuable but it will probably not be sufficient by itself, so do not be surprised if your students need additional help and support to work independently later. Team game-playing can be enormously valuable with the appropriate software but may present some practical problems.

Two programs designed for whole-class involvement are Tom Snyder Productions' discussion-provoking series *Decisions, Decisions* (for Grades 4 and up) and *Choices, Choices* (for Grades 1–6). A sample screen from *Decisions, Decisions* is shown in the following illustration.



Each program comes with support materials—booklets for *Decisions, Decisions* and picture cards for *Choices, Choices*. Using these materials will require you to turn the lights on and off each time you switch from the screen display to the booklets or pictures. Bear this in mind, and be ready for it.

Once you have solved the technical problems, involving the whole class in a demonstration and discussion around a quality piece of software can be a valuable educational activity.

Similar, But Different

In addition to using one computer with a projection device with your whole class to conduct demonstrations or stimulate discussions, it is also possible to do roughly equivalent activities either at the computer and away from the computer. The point is to choose an activity in which students can do some of the work on the computer and some at their seats. Students may all be working on the same project, but they can experience it in several formats.

For example, drill-and-practice math software, such as Davidson & Associates' *Math Blaster* or Edmark's *Carnival Countdown*, can be used for reinforcement activities at the computer, along with worksheets or problem sets completed away from the computer. You then can discuss as a group the differences between the computer activity and the seat work.

Another similar activity involves illustration work. Some students can illustrate their writing or reports with drawings in paint, collage, chalk, crayon, or marker, while others can use a computer drawing program. If they are illustrating stories of some length, they can create pages in a variety of media, or create their title pages on the computer and the rest of their illustrations in another medium. Again, a group discussion of the differences they experience can be quite informative. You may find that not everyone prefers using the computer for everything.

There are even programs that present math manipulatives on screen. Make sure that the computer re-creation of the activity enables your students to do the same things they can do with the real manipulatives. If you can create two trains of equal length with Cuisenaire rods, and each train consists of several rods, you should be able to do that on the computer, too. Previewing software becomes critically important. Let the students preview the software; you can return it if it does not do what you require.

Research, of course, can be done online and with paper-based encyclopedias, thesauruses, or atlases. Some activities work either way, although there may be slight differences in how quickly and how well the activity can be done. Sometimes I actually prefer wading through a book because I am not limited to the links a programmer has established.

You do not want to conduct two-way activities in which the computer can do most of the work. Do not ask most of your students to add up a column of figures in their heads and have only one student type a formula in a spreadsheet and do the calculations there. And certainly don't ask them to change one number and calculate the result again on the computer and away from the computer. You will surely have a revolt on your hands. The same is true for creating a crossword puzzle or a word search. When much of the activity requires manual labor that the computer can do, why would you have your students do it by hand?

Disks, Drives, and Storage Devices

It will be necessary to save copies of your work and your students' work efficiently and effectively. You probably have created administrative files (e.g., letters to parents, grade sheets, report card drafts, and requests for supplies). These should not be kept on your hard drive or school server because you have only one computer and your students will be able to find whatever you try to hide on its hard drive. Even password-protected areas on servers are vulnerable. Your administrative files should be kept on disks that are carefully labeled and stored where students cannot get to them.

Store any important file on two disks. If you take the time to write a report, spend 60 cents and 2 minutes to make a second copy. Disks get damaged or lost. Even if you are on a network, keep your work stored on your disks and teach your students to do the same.

Teaching materials, including tests and worksheets, software instructions, and word processing, database, and spreadsheet files, can be kept on your hard drive or server. However, you should always keep another copy on a disk just in case a student saves a completed version of your worksheet on the hard drive without changing the file name. Label the files with meaningful names so that you can find them later. Another good strategy is to keep a hard copy of all forms and worksheets, with the file name neatly printed at the top. When you need more worksheets, you can always make photocopies rather than tie up the computer.

Finally, your students will be creating files. Teach them to save their files to their own disks or to a disk and folder on your hard drive or server, if you have room. If you have *FoolProof* or some other hard drive or server locking system, you can create a student folder on the hard drive or server and specify that location as the only place where students can save files. If they all save their files to the same student folder, teach them to preface their filenames with their initials or some distinctive character. This avoids the catastrophe of everyone saving a file named "mystery" on the hard drive and ending up with only the last saved version.

Students should be responsible for taking care of their own disks. They can carry them back and forth to school in cases or in sturdy, padded mailing envelopes. Alternatively, they can keep them in their desks if there is no reason to take them home. Also, students should label every disk with their names and phone numbers or room numbers. The word "homework" written on a disk will not facilitate the return of that disk to its rightful owner after it has been inadvertently left in a drive.

Without some advance planning, backing up files on a Macintosh can result in a dance of the disks. The Macintosh system will not forget that a disk is in the drive until you have closed a file. Here is the problem: You do not want to close a file until you have saved it on two disks. The solution? Save the file to one disk, naming it carefully. Then save the file to the hard drive and close it so that you can switch disks. Eject the disk by using Command-Y (Y for "yank" it out) and insert a second disk. Then copy the file from the hard drive to the second disk. If you do not want the file on your hard drive (e.g., confidential files on a student's individual progress), drag the file from the hard drive to the trash and then empty the trash. This may seem cumbersome, but it works and eliminates those "Please insert the disk" dialog boxes that can be so annoying. If your students are old enough to save files to their own disks, they are old enough to learn this system.

I use the Save As command rather than the Save command so that I get a dialog box. This allows me to check that my file is in the correct format and location, and has the correct name. Teach your students to read the dialog boxes and follow procedures. If you do, they will know where their files are and what they are called. If you do not, they will need to learn how to use the Find File command—and they will need it.

Teacher Tasks: An Apple (or Mac or IBM) for the Teacher

If you have just one computer, use it yourself. Computers are valuable because they are versatile; for example, they can crunch numbers, words, and data, often in the same program. Computers are also valuable because they facilitate creating, saving, updating, and modifying files. This means that teachers can create materials for one class, save them, and reuse them with another class, making any necessary modifications. The following sections describe five different types of software you can use.

Word Processing

Most computers come with some basic word-processing package, and you will probably know how to use it. What can you do with one computer (and a printer, hopefully) and a word-processing package?

You can, of course, create a test. Be sure to date your test and identify the class for which it is intended. If you use the Insert Date option in *Microsoft Word*, for example, the computer will attach the current date every time you open the file, and you will never be embarrassed by handing out a test that is obviously out of date. (Of course, this only works if your computer is set to the correct date.) The beauty of creating a test with a word processor is that it gives you the ability to easily make changes so that the numbers in a math test, for instance, are not the same for every section of Algebra I that you teach.

You can also create progress reports on your students, including a basic paragraph that describes your program and your future plans. If you have a Publish/Subscribe or "Link to" option in your word-processing program, you can individualize the letters either for students or for classes, while inserting standard paragraphs explaining grading practices or attendance policies.

Databases

If you have a database program, you can track your students' addresses, rosters, reading habits, group assignments, and even allergies and emergency numbers. If the database program is integrated with the word-processing program (for example, as in any integrated package), you can create a form letter in the word processor and use mail merge from the database. This allows you to personalize letters to parents relatively easily. This is how the mail-order companies and book clubs do it. However, a word of caution: Make sure your database has sufficient categories to generate intelligent letters. I once received a form letter from my son's high school that began "Dear Parent, Congratulations. Your son or daughter Michael has just been elected to Honor Society." That's just silly. If the database had contained just one more field that offered a choice of "son" or "daughter," this problem could have been avoided. Reread your letters to ensure that they do not contain grammatical oddities caused by gender change or the like. With a little extra effort, we can all sound intelligent.

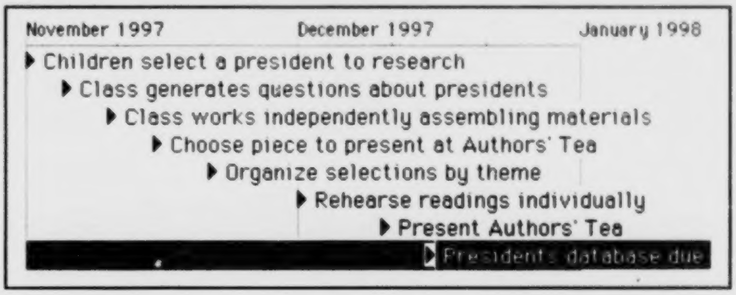
Spreadsheets

If you have an integrated package, it probably includes a spreadsheet, which means that you can create an electronic grade book. The beauty is that once you create the template, with weighted scores and look-up tables to assign letter grades, you may never have to do so again. There are prewritten, dedicated gradebook programs, but *ClarisWorks* comes with an assistant form that coaches you through the creation of a grade book and makes the whole process practically painless. Explore the prewritten stationery, wizard, and assistant forms of your integrated package. You might find something there that does just what you need. Why reinvent the wheel?

The spreadsheet program also will handle your department or grade-level budget, of course, and the more sophisticated ones will generate dandy charts and graphs that will impress everyone. It took me 20 minutes to show a class of undergraduates how to use the chart and graph features in *Microsoft Excel*, a spreadsheet program included in *Microsoft Office*. It can be that simple, and it should be.

Timeliners

Timeliner software, such as *Timeliner*, from Tom Snyder Productions, or *The Chronicle*, from Sunburst Communications, can be used to plan your school year by subject and activity. You need not enter things in chronological order because the software will rearrange things appropriately. Thus, you can map out any activities related to a specific time of year, holiday, or special event. Then you can go back and add the other activities where they fit. Moreover, these packages enable you to merge timelines, so you can theoretically map out each content area individually and then merge them to see where the interrelationships might be and whether the work is balanced among subjects and assignments. You need not generate a huge banner. (A banner is the format in which the timeline is displayed.) These programs will also list activities in a more manageable page format, such as the one shown in the following illustration.



November 1997 December 1997 January 1998

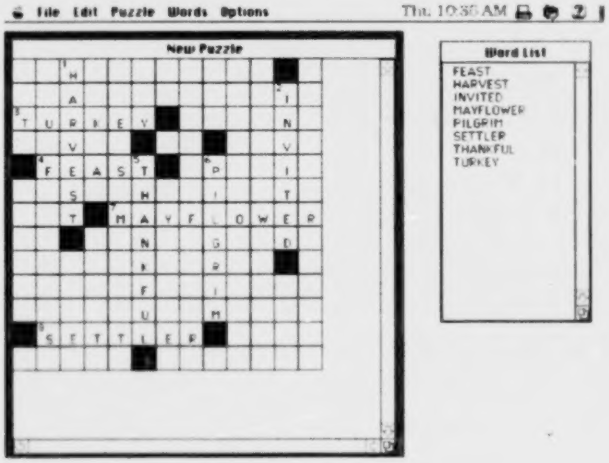
- Children select a president to research
- Class generates questions about presidents
- Class works independently assembling materials
- Choose piece to present at Authors' Tea
- Organize selections by theme
- Rehearse readings individually
- Present Authors' Tea
- Presidents database due

Puzzle Generators

Look at programs that create puzzles and seatwork activities. Although I prefer the idea of students creating puzzles for one another, you too can easily do this with good software, without fancy technology. The best puzzle generator I have seen, *Classroom Toolbox*, is from Sunburst Communications and is only available for the Apple II. It will generate free-form tests, including reading comprehension paragraphs, or a variety of puzzles, such as multiple-choice, word scrambles, matching, crosswords, and true/false.

You can use the same database to generate all of the puzzle formats except the true/false. You can specify the wrong answers for the multiple-choice and either vary or hold constant the order of questions and answers.

Although *Classroom Toolbox* is superior, several other puzzle generators, such as *Puzzle Power* and *Worksheet Magic*, are pretty good. A sample crossword generated by *Puzzle Power* is shown in the following illustration.



FEAST
HARVEST
INVITED
MAYFLOWER
PILGRIM
SETTLER
THANKFUL
TURKEY

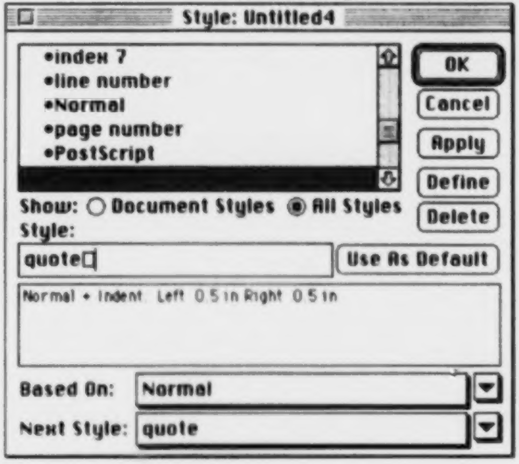
As you begin to use these tools, it may seem that learning a new piece of software, no matter how user-friendly, involves a lot of effort. But give yourself permission to try it, explore it, and see what can be done. Be sure to save whatever you do so that it can be adapted for a future class. By using a few software programs, you will ultimately save time and effort, and probably end up with a more usable, presentable product.

Previously Invented Wheels: Styles and Templates

Defining a style in a word processor or other application enables you to repeatedly use a combination of formatting instructions. Creating a template, or, better still, using an already-existing one, lets you avoid having to reinvent wheels that are already in motion, so to speak.

Creating a Style

Microsoft Word and the word processors in *Microsoft Works* and *ClarisWorks* allow you to define styles. What exactly is a style? One familiar example is the indentation of a quote in a research paper that requires the margin to be inset from the margin of the rest of the paper and the text to be single spaced rather than double spaced. To define this style, you format one quote by highlighting the text and then applying the margin and line spacing changes. Then, placing the cursor within that text, you can go to the Format menu and choose Style. In the dialog box, choose the New option and name the style. Use a meaningful name so that you know where this formatting should be applied. For instance, you can name this style "quote" and then apply it to any quote in your text. All you have to do is move the cursor within any paragraph and choose "quote" from the Style dialog box. The word-processing program will then change the margins and line spacing to conform to your definition. Here is an example of a Style dialog box with "quote" selected.



Show: ○ Document Styles ● All Styles

Style: quote

Normal + Indent: Left 0.5 in Right 0.5 in

Based On: Normal

Next Style: quote

There is probably also a Styles window in your word-processing program. Where, you ask, is it located? One of the small windows on one of the toolbars identifies the font and size, and there is probably another window next to it, or just beneath it, with a down-pointing arrow beside it. That's your Styles window. The defined styles available to you are listed when you click and hold open the window. The styles also appear when you choose Style from the Format menu in *Microsoft Word 5.1*. Just click on the All Styles radio button and you will see the predefined styles for this particular word-processing program. There are also predefined styles in the Styles Gallery in *Microsoft Word 6.0*. Look in the pull-down menus and see what you can find. The point is to use the tools other people have taken the time to invent instead of reinventing all of them yourself.

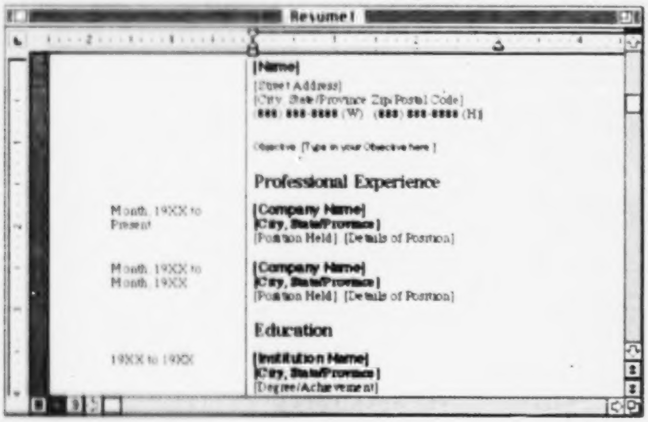
Styles you define can be applied only in the document in which they were created. However, if you create a style that you intend to use repeatedly, such as an indentation for a quote, you can customize a toolbar button and make that style available for every document.

Using Templates

In addition to styles, you can use pre-existing templates. A template (*ClarisWorks* and old versions of *Microsoft Word* call it Stationery) can be defined as a blank document with all the necessary styles already described. These predefined styles will all appear in the Styles window. You simply type in the text and then apply the appropriate styles.

To find out which templates have been loaded into your version of *Microsoft Word*, choose Templates from the File menu. A dialog box will open, and if you click Add the program will list all the available templates, e.g., for brochures, memos, letters, and invoices. You can also open a new document, at which point the program will give you a choice of templates for your document. Once you choose a template, all the styles you will need for that template appear in alphabetical order in the Styles window.

Some of the "wizards" in *Microsoft Word 6.0* not only create a template but also prompt you for text to fill in particular areas of the template. For example, one wizard creates a résumé and does everything for you but type. An example is shown in the following illustration.



[Name]
[Street Address]
[City, State/Province Zip/Postal Code]
(888) 888-8888 (W) (888) 888-8888 (H)

Objective [Type in your Objective here.]

Professional Experience

Month, 19XX to Present
[Company Name]
[City, State/Province]
[Position Held] [Details of Position]

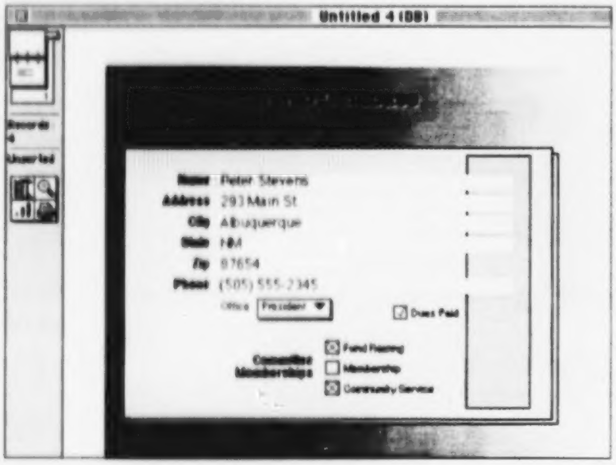
Month, 19XX to Month, 19XX
[Company Name]
[City, State/Province]
[Position Held] [Details of Position]

Education

19XX to 19XX
[Institution Name]
[City, State/Province]
[Degree/Achievement]

These template features can be truly helpful. Other word processors have similar template features.

As another example, the database in *ClarisWorks* contains a template for generating a list of information on members of an organization, as shown in the following illustration.



Name Peter Stevens
Address 293 Main St
City Albuquerque
State NM
Zip 87654
Phone (505) 555-2345
Office President
☑ Dues Paid

Committee Memberships
☒ Fund Raising
☐ Membership
☒ Community Service

Templates are also available in *Microsoft Excel* and in the *ClarisWorks* spreadsheet program. Some of these templates allow you to set up a grade book and describe not only how to use the existing spreadsheet but also how to modify it.

If these tools are part of the software loaded on your computer, you have a wonderful resource at your fingertips. There is no need to buy another piece of software, and no need to reinvent the wheel.

Avoiding Technological One-Upsmanship

When I first pursued a degree in computers in education, I received calls every November from nervous, affluent parents of toddlers asking me what computer to buy so that their children would not fall hopelessly behind in the Information Age. My advice to them then, and to some extent now, would be to go to the bookstore, buy the best children's books, and sit down and read to their children every day. The message I hoped to convey was that some activities, although not very innovative or futuristic, are irreplaceable and educationally worthwhile.

When we turn down the volume on all the hype about computers, we can all point to perhaps a dozen programs that are truly valuable, and a few others that serve a limited but interesting purpose. Moreover, many software programs suffer from design flaws. They are not sufficiently user-friendly; the technical problems they present (such as access to CD-ROMs and laserdiscs) have not yet been worked out; they amuse rather than educate. So-called experts may tell us that "all" we have to do is purchase the newest gadget, but it rarely turns out to be so simple.

Responsible computer-using educators must remember a few things. We need to be demanding consumers who refuse to spend hours on the phone with technical support personnel. Instead, we should return cranky, difficult pieces of software with an explanation of their inadequacies and our requirements. Also, we need to be clear about the educational merits of the activities we choose for our students. "The students really enjoy it" is not a sufficient reason for using a particular piece of software. We ought to understand and exploit the learning that takes place around the computer.

Finally, new technology is not necessarily better. What you have now may suit you just fine, and a new program may not work well on your older machine (as *WordPerfect 6.0* for Windows does not on my old IBM), leaving you gnashing your teeth for the good old days. Word processors come with all kinds of bells and whistles, some of which may be distracting rather than useful. Decide what you want to do and why you want to do it. Then choose technology that enables you to do it easily and well. Do not be upset if you are not using the software of the moment. If there is value in what you are doing, stay with it until you find a better way, or something better to do altogether. You are the best judge of the value of an activity for you and your class.

I began writing this book with the intention of helping teachers do the best they can with limited equipment, specifically, one computer in a self-contained classroom. My message here is to reassure you that your activities may be valuable and instructive even though they do not make use of the newest program on the biggest, flashiest machine. Many lowtech activities, like reading to a toddler, are critically important in educational programs.

How do you judge a new piece of software? I remember the weekend I spent playing *Where in the World Is Carmen Sandiego?* when it first came out. I knew it was fun, but as I watched my son play the game, I realized that he was learning new vocabulary and geographic information almost effortlessly. Watch your students work with a new piece of software. What questions do they raise? What discussions are provoked by the problems the software presents? Is there a connection to the rest of the school day? If you observe closely, you will know whether a piece of software belongs in your classroom.

Conversely, I also remember buying and trying *The Newsroom*, an early attempt to combine text and graphics in a classroom publishing program. It required four storage disks and endless swapping of program disks. Frustrated, I quit and lived without a children's publishing program for a year or two, until *Children's Writing and Publishing Center* was released. It was worth the wait to use a program that required no extensive training or elaborate file management.

I have learned how easy it is to feel hopelessly behind the times and appallingly ignorant in this field. But keeping current is not the point. As you leaf through catalogs of new software, how many titles really seem useful? Feel free to order them, preview them with your class, and judge them for yourself. You can keep them if you like them, but you must remove them from your hard drive if you return them. The decision is ultimately yours. Know why you do what you do in your classroom, and do not allow anyone to play technological one-upsmanship with your head.

Keyboarding

I once heard a joke about a mother who watched her daughter fold a towel, in thirds and then in half, and took the towel away from her, saying, "No, no, you are doing it all wrong. Let me show you how my mother taught me." First, she folded the towel in half the long way and then in half the other way. Then she turned back one side perhaps a quarter of the way. The daughter asked, "Why do you do it like that?" The mother replied, "That's how my mother taught me." Curious, the daughter went to her grandmother and said, "Show me how you fold a towel." Sure enough, the grandmother did it the same way. The daughter asked her why she folded it that way, and the grandmother replied, "I had a very narrow shelf in the first house I lived in, and when I folded towels this way they fit on the shelf."

The point is that sometimes we continue to use the same old solution when the problem has changed. Here you are with a single computer in your classroom, and as you send your kids back to it, one by one or in pairs, you notice that they are extremely slow at finding letters on the keyboard. Your principal tells you that all the students must learn keyboarding and gives you a piece of typing tutor software. You sense that there must be more interesting uses for your one computer, but they really need help finding the letters. What are you going to do, and why are you going to do it?

You could follow the principal's suggestion and have the students practice keyboarding. After all, you have the software and the computer, and they really are slow. But you know what is wrong with that picture. Learning to touch type is boring, and using *Where in the World Is Carmen Sandiego?* is not! You may also feel that touch typing is developmentally inappropriate for students at your grade level even though you know it eventually could be useful to them.

That is the key: when to do this particular activity. I have observed young students keyboarding in second-, third-, and fourth-grade classrooms with only two computers, and have noticed significant differences between students' keyboarding with typewriters and computers.

Let's start with that: typewriters and computers. Touch typing was developed to allow secretaries to create typewritten documents on paper from other sources, such as handwritten notes, shorthand, or taped dictation. The system enabled secretaries to be very fast and accurate while not looking at the keys or at the emerging paper document. It was important to be fast because there was a certain volume of work to be done. It was important to be accurate because it was so hard to make changes. That was the problem, then, and touch typing was the solution.

Young students composing on computers have less need for speed. They need to find the keys only as quickly as they think of words to write, and the younger they are the slower this process is, given their need to invent spelling and so forth. And accuracy is also less important. Text composed on a computer can be easily altered, revised, and edited—this is one of the word-processing program's real values. Compositions need not be perfect the first time, which is what we tell our students about writing anyway. Younger students who can think of and type four to seven words a minute are working faster on a computer than they probably could by hand. In addition, their work is guaranteed to be correctly formed, properly spaced, and produced from left to right and top to bottom. It will also continue to be legible as it is revised, and the student will never need to tediously recopy to get a final draft.

Thus, students as young as eight years old need be neither fast nor accurate. They can look at the keyboard or at the screen. If for some reason you do have students typing from a prewritten draft, put the draft in front of them between the screen and the keyboard to simplify the task of going back and forth between the handwritten draft and the keyboard. The point is that touch typing is less critical for an eight-year-old composing on a word processor than it is for a secretary transcribing a document. The problem is not the same, and the solution should reflect that. I feel certain that a preoccupation with teaching touch typing to young students is an overreaction to the situation.

Some kids have never written at keyboards, however, and they may need help getting started. Here's one way to help them. Two teachers whom I observed working with third and fourth graders photocopied a printout of the computer keyboard. (The Appendixes provide a keyboard you can reproduce.) Then they pasted the photocopies to cardboard and laminated them. Voilà! Instant laptops, sufficient for practicing finding keys, which is what students need to know. The teachers took a few minutes each day for the first six weeks of school and had the students practice finding the letters for spelling words, one another's names, book titles, and "morning stories." They used this activity as a "gathering" activity first thing in the morning or right before recess or lunch. After four to six weeks, the students simply resisted doing it because it was too boring and they didn't need to. In interviews at the end of the year the students spoke of the value of using laminated printouts of the keyboard but remarked that six weeks was sufficient. But when they went to the computer to work, they knew where the "p" was. And that seemed to solve the problem.

So what about touch typing? Many people who use keyboards extensively (programmers and pharmacists among them) do not touch type. George Bush does not touch type, but it did not limit his career opportunities. I personally touch type and regard it as a useful skill. Not essential, surely, but useful. The question then remains: when should you teach touch typing?

Touch typing, like any physical skill learned by rote, requires frequent structured practice sessions that are best performed when children are developmentally ready. I think middle school is a great time for this. It fits into the schedule when physical education is offered several times a week and typing can be offered on alternate days in a lab where every student works individually. Middle schoolers (fifth grade and up) have the language skills and the physical dexterity needed to perform the keyboarding operations, as well as the mental dexterity needed to picture words in their minds. Also, young adolescents like to feel adult and masterful, and learning to touch type can contribute to that feeling.

The point is that in the one-computer classroom, there is an efficient way to help students learn enough about the keyboard to do the educationally valuable activities you have chosen for them. Also, their familiarity with the keyboard will help them learn to touch type when they can be taught efficiently at the appropriate age on individual computers several times a week. Think carefully about the best use of your computer resources.

Educating "Crap Detectors"

Keyboarding is not an intellectually valuable activity, and it wastes time and resources in the one-computer classroom. By contrast, teaching students to think about the quality of information is intellectually valuable, and computers offer a golden opportunity to do just that.

Years ago, I read a mind-altering book, *Teaching as a Subversive Activity*, by Postman and Weingartner (1969). They suggested that teachers should be preparing students to be "crap detectors." By this they meant that we should help students recognize bogus arguments, unfounded claims, and outrageous statements. I have already argued that teachers need to be critical consumers of hardware and software, impervious to meaningless hype and oversell. We must also be crap detectors. In this age of the love affair with the Internet, our students also must also certainly learn to distinguish valuable material from electronic graffiti.

The information superhighway can offer the opportunity to practice crap detection. Here's one scenario. You and your students are using the Internet to gather information on a particular subject. Your class will eventually develop a research paper from that information. You have found information in many places—at World Wide Web sites, in an Educational Resource Information Clearinghouse (ERIC) database, and in anecdotal reports from teachers with whom you have "chatted" in "chat rooms." How "good" is your information? How reliable is your source? How can you possibly know? What constitutes a usable reference?

Cruising the information superhighway will no doubt help you amass pages of captured documents. You and your students can either collect information and organize it without seriously examining it, or make that examination an opportunity to hone your crap-detection skills. It is necessary to determine the identity of the author, assess his or her qualifications, and find out whether there is any way to be certain that the representation is in fact accurate. On the information superhighway, some sources are clearly what they purport to be, but others are not, or they are deliberately unclear about how they know what they know. "It was on the Internet" is not sufficient documentation. Where on the Internet was the information found? Who assures us that the information is solid?

A case in point: Northwestern University has a Web site, and Northwestern University is an honorable institution. At its site, students and professors associated with Northwestern write and publish individual Web pages. One engineering professor has posted a Web page on which he argues that the Holocaust never took place. How do we teach our students to recognize this for what it is, an exercise in free speech supported and defended by the university, but neither reliable nor truthful? Will they remember to question his argument rather than accept it at face value? Will they ask how good his information is?

But, you say, we all have to ask these questions when we read a newspaper or journal article. You are absolutely right. We do, and we should. Just because something appears in print does not make it true. I would submit that electronic print is at least as questionable. And if we teach only this valuable lesson to our students, we will have done our job. Demagogues can gain no foothold if we recognize nonsense when we see it.

What constitutes a source? Hearsay conversation, electronic or otherwise, should be identified as such and given the weight it deserves (not much). Articles that appear in databases, such as ERIC, have at least been "vetted" (reviewed) by professionals. The articles can be referenced with an ERIC document number. One purpose of a reference or bibliographic note is to allow the reader to retrace the writer's steps, check the contexts of quotes, and judge whether the reference has been correctly used. With an ERIC document number, the reader can do just this. With a reported "chat," this is impossible. A wide range of possibilities exists within this spectrum, such as Web sites, on which a single person can say anything he or she chooses, and e-mail, which could have been written by anyone.

But let your students go out there and gather information as long as they have the time and ability to distinguish between the solid, dependable information and the snake oil. And use the same skills yourself: Do not buy hype, especially about computer hardware and software. Develop the ability to recognize nonsense when you see and hear it. Help your students to judge whether a writer's opinion has weight, and why.

The information superhighway is truly an unregulated assortment of destinations. Use this as an opportunity to develop crap detectors.

What Constitutes a Source, or "It's on the Internet. It Must Be True."

How do you and your students choose and cite sources from the Internet? Suppose you have surfed the Internet while researching the subject of thinking, and have found some nifty stuff on the World Wide Web from the Center for Critical Thinking in Sonoma, California. How do you cite it in your paper?

Why do we use citations anyway? Why do we need bibliographies and all those nit-picking formats? Citations serve two purposes. First, a citation strengthens your argument or premise by identifying other writers whose points of view coincide with or support your own. Second, a citation identifies the source of an idea or quote so that other people can find the idea or quote and read the original in context.

Look at these two purposes separately and consider them as guidelines for citations from the Internet. What sorts of citations downloaded from the Internet would strengthen your argument or premise? Citations from professional organizations, e.g., the Center for Critical Thinking, NCTE, or NCTM, surely would further your own argument because they represent authoritative voices in their respective fields. These citations come from groups whose involvement in their fields is serious, ongoing, and knowledgeable. Similarly, citations taken from scholarly papers published on the Internet (as from ERIC) refer to works that have been "vetted," read by editors, and assigned document numbers. Electronic versions of magazine, newspaper, and journal articles can be used as references, though their citations could actually include the volume and number of the print version. These articles are endorsed by the publisher, and therefore constitute legitimate sources.

Your students may also find information at sites of such organizations as NASA or the Smithsonian Institution. Such sites represent the work of authorities in their fields; these are reputable groups whose Web sites are maintained by scholars. They can be referenced in your students' papers with URLs, enabling a reader to find the same information. Be aware that material on the Web can be "unpublished," or removed from the site, rendering a reader's retracing impossible.

What about online conversations with "experts in the field"? Actually, you can only assume that you are talking to an expert in the field. Because your only communication with this person is electronic, how do you know the person is the authority he or she claims to be? You might be talking to his or her 12-year-old daughter. But let us allow that you know you are dealing with the actual person. Several pieces of information are needed to accompany quotations from such conversations. First, within the body of a paper, it is appropriate to identify these conversations as "personal communications." Second, it is the writer's responsibility to explain who is being quoted and why that person's point of view is valuable. What credentials does this person bring to the debate? What authority does the person possess? With all this in mind, it becomes clear that this sort of citation constitutes a very weak link in your argument and ought to be backed up with more reliable references.

In this new and unclear territory, we must make analogies from the guidelines we already possess. No one would consider quoting as a definitive argument in a term paper a comment made by an unidentified stranger overheard at a cocktail party. Similarly, the points of view, quotations of statistics, and "facts" advanced by private persons in chat rooms would be highly suspect (or virtually useless, no pun intended) in a scholarly paper. Just because Mr. White says that 43 inches of snow fell in his hometown yesterday does not make it true.

We come then to the second purpose of citations. Citations allow us to locate the original writer of the idea or quote. If my students download something from the Internet to use as a source, I ask them to note the author's or organization's name, if they have it, in parentheses within the body of the paper, just as they would cite the author of a book or article. In the bibliography, I expect to see a reference to an ERIC document number, if one exists, or some other reference to printed matter because this would enable me to locate the article in several ways. If the student has seen the material only on the Internet or the Web, I require the URL as identification of the source of the citation. Again, my purpose is to find a path to the original source and have a way of knowing how and why that source is valuable.

The Internet is an information superhighway, and the words on it come not only from learned sources but also from the electronic equivalent of subway walls—and from everything in between. In using the Internet, we have an ideal opportunity to teach our students to separate authority from demagoguery, honest scholarship from quackery, and reasoned argument from personal opinion. In fact, we have an obligation to do just that.

Chapter 2

Ideas for Using Integrated Packages

Word Processing

This book assumes you have a computer in your classroom. Let's also assume you have a word-processing package. Now you would like to somehow use this writing tool with your students.

If you want to have students write with a word processor, have them write a complete piece from start to finish on the computer. Research, my own and other people's, indicates that students who write with a word processor write longer pieces, include more information, and revise more willingly (Cochran-Smith, Paris, & Kahn, 1991; Kahn, 1987). Providing students with access to your single computer is the problem. Too often, teachers believe that they must provide equal time every day or every week for each student. The result is that everyone gets only a little time at the computer; in fact, everyone gets too little time to do anything useful.

Word Processing From Start to Finish

A better solution is to arrange for each student to have the opportunity to write at least one piece from start to finish at the computer. This means that Joey may use the computer every day for a week and not again for a month. However, giving him continuous access to the computer means he has the opportunity to begin a piece, conference about it with you and his peers, revise and rethink it, and finally edit and publish it.

Another solution is to encourage your students to work on their writing on their home computers. This works well if both computer systems and the software are similar, but it may also work even if they are not. For example, students can learn to save their writing as text with line breaks on two different systems. (In most word-processing programs, they can choose the Save As option and then choose the Text with Line Breaks format.) Most word-processing applications can open this type of file.

The only trick is to open the word-processing application first and then open the word-processing file from within the application.

Suppose, for example, that one location has a Macintosh computer with the capability of reading PC-formatted disks and that the other location has a PC. In this situation, students can begin by saving their writing in a word-processing file as Text with Line Breaks on a PC-formatted disk (because that's the only kind of disk that can be read by both systems). Then they can open the word-processing application on either the Macintosh or the PC and use the File menu to open the file from within the application.

Whatever the case, students do not need to format their text until they are ready to print it, and they can do that at the last minute on any computer that is handy. Emphasizing the creation of unformatted text underscores the message you want to communicate—that writing is about meaning, not about the typeface used or glitzy special effects.

Writing Together

Students can also write together, which introduces valuable educational opportunities. There are a number of joint word-processing activities that make use of just one computer.

First, students can write in pairs or trios at the computer. This works only if the topic is carefully chosen. Obviously, they cannot write about what they did on their summer vacation unless they all vacationed together. The topic must be one on which they have shared knowledge. They could write a research report together, but concept-mapping software may be more useful for this than word-processing software. (More about concept-mapping later.) They could write a script together; playwrights have collaborated for years. However, this could tie up a computer for a very long time. Instead, here are some other more practical suggestions.

One very successful collaborative writing activity I watched in a second-grade classroom involved the creation of a set of instructions for growing a sweet potato plant. This idea can be adapted for a variety of topics.

After you have completed a demonstration or activity with a class and produced something (e.g., plants, mobiles, dioramas), two or more students can use the computer together to write a list of instructions for repeating the activity. This process is useful for several reasons. First, both students took part in the activity, so they both know what they are writing about and they are writing about the same thing. Second, the activity has a sequence of steps, making the writing easy to organize. Third, the writing is going to be published, probably next to the product it describes, and this public display provides incentive for getting it right. Finally, the instructions themselves are valuable because they remind everyone who reads them of the process involved in creating the product.

Commenting on Text

As a teacher, you can type a quotation, a passage from a poem, or a paragraph with an obscure word in it and invite students to comment on possible meanings of the text. They can sign their comments if they wish, or, better yet, you can discuss with them how they think the assignment should be done, and why. Collecting responses to a writing prompt in this manner facilitates a discussion in which everyone gets a turn, even the student who never talks in class. It also gives students the opportunity to read one another's points of view carefully and respond appropriately. At any point where it seems profitable, you can print out the responses and photocopy them for the whole class so that the discussion can continue away from the computer. This activity works only if the text you have chosen allows for multiple interpretations, so pick carefully.

Progressive Stories

Word processing can also be used to create a "progressive" story. We used to do this around a campfire. One person would begin the story, the next person would pick it up, a third person would continue it, and so forth. The virtue of doing this on a computer is that each student's contribution is anonymous, and the final product can be printed out and used for class discussion, or, if the story turns out well, for publication. The discussion might address questions of sequence or mood change, or how well the story flowed from one idea to another. You could then take one sentence out of the story, use it to begin another story, and see where that one goes. Or individual students could take ownership of the topic and write the story as they see fit.

This activity demonstrates that fiction is a writer's creation and that a story can go in a variety of ways, some of which may be more appealing than others. Students need to understand the malleability of writing, and this activity may help.

The Thesaurus, or Words of a Different Color

Another way to demonstrate the range of available choices for your students is to have them use an online thesaurus. Choose a piece of text, poetry, or prose and type it into your word-processing program. Then highlight it, copy it, and paste it directly below the original. Between the two copies of text, type directions that invite students to highlight words in the text, use the online thesaurus to discover possible synonyms or antonyms, and replace the words in their version of the text. You can select and italicize particular words yourself, especially if they represent vocabulary ideas you are trying to illustrate, or word-formation ideas, such as prefixes or suffixes. Have your students save and print their paired versions, along with their critique of the two versions. Invite them to articulate what they think their changes accomplished, how the tone was changed, and how the meaning was changed. You probably will want to avoid questions such as "which one is better?" because these types of questions will not lead to much useful analysis.

Here is an example of this process, using a few sentences from *The Outsiders* by S. E. Hinton:

> The next thing I knew I was lying on the pavement beside the fountain, coughing water and gasping. I lay there weakly, breathing in air and spitting out water. The wind blasted through my soaked sweat shirt and dripping hair.

After a few word changes, your students might come up with this version:

> The next thing I perceived I was recumbent on the pavement beside the fountain, coughing water and panting. I lay there feebly, breathing in air and spluttering out water. The wind exploded through my soaked sweat shirt and sopping hair.

The narrator of *The Outsiders* is a teenage boy, and the author chooses words an adolescent boy of a particular social class and educational level might choose. This use of the thesaurus resulted in the selection of the words "perceived" and "recumbent." If this were the only text we had, we might conclude that the narrator is an older, slightly stuffy person.

After the whole class has completed this activity, you could have an interesting discussion about diction and the word choices people make for particular situations, both in writing and speaking.

Incidentally, in this case, my use of the thesaurus that came with my version of *Microsoft Word* for the Macintosh meant that I had to modify some words to get usable synonyms. I had to change "knew" to "know" for the thesaurus to offer any synonyms at all, and then I had to change the tense back again to get the passage grammatically correct. I had to search through offerings for "lying" that included "falsifying" and "dishonest" to choose the word "recumbent." Students who do this activity will have similar difficulties, which I perceive to be learning opportunities. An online thesaurus and just a few sentences from a classic book can help students increase their vocabularies and stimulate high-quality discussions involving shades of meaning.

Word Processing and the Teaching of Writing

When I teach adults how to use word processing, I use standard activities to demonstrate how to insert text anywhere in the document and how to cut and paste. Of course, these adults already know how to write and simply need to learn how to write with a word processor. They know that revision involves inserting words and phrases that clarify meaning. They understand that adjectives and adverbs give writing texture and color. They understand that writing should flow from idea to idea. All they have to learn is how to use a word processor to do what they already know they should do.

Interestingly enough, you can use these same activities when teaching youngsters who are just learning to write and use word processing. But for them, learning the mechanics of word processing underscores the writing lesson. These activities are not simply valuable practice in using word processing—they help younger students learn how to write.

Inserting Text

The first word-processing activity I have my students do is open a text file I have created. The text should have no adjectives or adverbs. You can use any descriptive text from any book in the room, or you may borrow the text supplied here:

> It was a night. The trees moved in the wind and the stars blinked in the sky. I was walking home when I met a man. He had eyes and skin and arms and legs. He was a creature. He said to me, "Can you show me a place to stay? I am new here and I need a bed and a meal."

The instructions to your students should appear above the paragraph. They should ask the students to decide on the mood (romantic, comical, spooky) they want the text to convey and to choose words that will create that mood. To add the words they want at any location in the text, they should place the cursor at the desired location with the mouse or the arrow keys. Here's the text I generated as an example for my graduate students (not appropriate, of course, for young students). It has a decidedly romantic twist to it:

> It was a beautiful, soft spring night. The tall, graceful trees moved in the warm wind and the crystal stars blinked in the deep black sky. I was walking slowly home when I met a tall, dark, and handsome man. He had soulful eyes and glowing skin and muscular arms and legs. He was a breathtaking creature. He said to me, "Can you show me an attractive place to stay? I am new here and I need a clean bed and a warm meal."

When you try this with your class, instruct your students to save their stories with their own names and print them out so that they can be shared with the class. They will be interested to hear the choices their classmates have made and how the story changes with those choices. I had to choose my words with care to express the mood I intended. If I had chosen other words, I surely could have created a scary story in which the man was a menacing presence.

What makes this a good computer activity? The nature of word processing allows revisions of any length to be made at any point in the text. If I handed out a worksheet on this activity, I would have had to leave blanks of a defined length in particular places, thereby dictating the location and length of the students' additions. And, of course, the students would not be able to erase anything on the paper. On the computer screen, they can revise in any way they choose. If we want students of any age to understand that writing is about choice, then word processing is the medium to illustrate that.

Cutting and Pasting

Another revision technique students can use involves reordering sentences. As I reread my writing, I frequently find a sentence that should be moved to make ideas flow more smoothly. Cutting and pasting allows me to do exactly that, and I am endlessly grateful for word-processing programs that allow me to rearrange things. Teaching students to reorganize their writing can be done either at the time they are actually writing (which requires you to be present at precisely the right moment) or in a whole-class activity using a prewritten file. You may need to remind them later that rearranging can (and should) be done, but the idea can be introduced early as a usable strategy.

Here's one way to start: Create a word-processing file in which a verse of a familiar song or nursery rhyme has been scrambled. (I always use America the Beautiful, but I sometimes find it necessary to remind my students of the correct words.) You can supply a correct printout as a reference. With minimal instructions, students can rearrange the lines correctly. They will also have to learn how to remove extra returns or insert additional ones. But let them figure out how to do this on their own.

After students have mastered these strategies in "canned" lessons, move quickly to their own writing. These activities have value only if students use the lessons to make their own writing more expressive. However, a little guided practice is always valuable, not only because they will learn some word processing from it but also because it will help them develop their writing skills.

Publishing

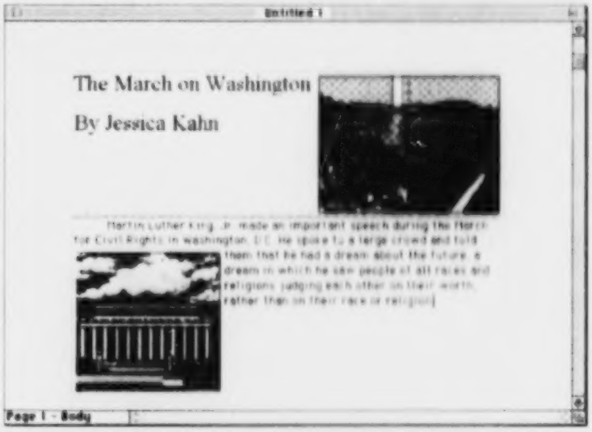
It may be difficult to find time for everyone to compose, revise, and edit every piece of writing on your single computer. But given sufficient experience, you should be able to use the one computer in your classroom with any good publishing program to help your students create attractively formatted written material that can remain in your class library, in your students' portfolios, and in their parents' collections of educational treasures.

What does publishing accomplish? Why is it important? What teaching opportunities are connected with publishing? What learning opportunities are connected with publishing? What can the computer provide?

Publishing is performance. At the end of the year there is invariably a musical evening at school, where the beginning flautists and accomplished singers all have a chance to demonstrate what they have learned during the year. Publishing does for literacy what the spring concert does for musical ability. It provides a purpose for writing, a reason to practice and polish, and an opportunity for feedback.

By the end of the school year your students will have (hopefully) written stories, poems, papers, and journal entries. Some of these may have been polished into final form, but many may have somehow been lost along the way. Publishing can be the incentive for young students to return to unfinished material and experience closure. It can provide an opportunity for them to use (and for you to evaluate) all their editing skills. Publishing can provide an occasion to review the work of the past year and assess growth.

If you have only one computer in your classroom, much of your students' writing will likely be done by hand. You can use the promise of publishing as an incentive for your students to complete those abandoned, half-realized stories. Tell them that once their manuscripts are ready, they can type them into a publishing program, choose a typeface and graphics, and create books. Several programs, including *My Own Stories* and *The Writing Center*, from The Learning Company, and *Easy Book*, from Chickadee Software, will allow your students to create attractive products. The following is an example of work created with *The Writing Center*.



The March on Washington

By Jessica Kahn

Martin Luther King, Jr. made an important speech during the March for Civil Rights in Washington, D.C. He spoke to a large crowd and told them that he had a dream about the future, a dream in which he saw people of all races and religions judging each other on their worth, rather than on their race or religion.

Publishing also offers an opportunity for students to experiment with typefaces, graphics, and formatting. Some programs, such as *Creative Writer*, from Microsoft, have so many jazzy "bells and whistles" that they sometimes distract beginning writers from their writing tasks. I suggest having students create a text file in *Microsoft Word* and then import it into *Creative Writer* or a similar program after they have lovingly revised, edited, and shaped their work. Giving students the opportunity to publish their writing in an attractive font and with special effects rewards them for carefully developing their ideas and telling their stories.

Publishing offers students a reason to use a spell checker, grammar checker, and thesaurus. These are valuable tools that enable students to take charge of the editing process in important ways. They can use the spell checker to independently catch and correct their obvious misspellings. They may even be able to use grammar checkers, although I have not seen many that I find terrifically helpful. As has already been noted, a thesaurus enables young students to experiment with vocabulary options as they try to find the best possible word.

Knowing that their work will reside in the school or class library gives students a reason to get it right. You must ensure that the publishing process includes not only sufficient computer resources but also human resources that will help students achieve correct usage as well as accurate mechanics. Mechanics can be handled by a machine; only humans will recognize usage problems. Plan to have someone available to proofread student work for the "confusables," such as "they're," "their," and "there," and "to," "too," and "two."

Use the one computer in your room to print attractive, functional manuscripts. Then use these printouts as reading material for your own class or for other classes. Your older students can create manuscripts for younger students, either for specific students or for a whole class. One way to prepare older students to write for younger students is to have the

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older student, a fifth-grader, perhaps, interview the younger student to discover that student's particular interests. Then the older student can construct a story tailored to those interests, using the younger student's name as well as the information he or she supplied. As students assemble their library of books authored "in-house," they can take the opportunity to read each other's books and thereby get ideas for new approaches and new ways to organize and present their stories.

Publishing can include activities involving crossword puzzles, word searches, jumbles, and other word games. This is an excellent way to see how much you students can remember about their social studies or science unit. They can create a science-related crossword puzzle and add it to a binder of "spare time" activities. If the puzzle is mounted in a plastic cover, students can solve it by writing on the plastic with a washable marker, erasing their solutions with a wet paper towel when they finish, and leaving the puzzle without the answers for the next student. Alternatively, you can photocopy the puzzle and leave multiple copies in the plastic folder. Either way, the students who create the puzzle have the opportunity to organize and present what they have learned, while the students who solve it reinforce their learning.

Publishing creates opportunities for students to receive feedback about their work and to see other students' work. In this way they can begin to understand their progress as writers. Other students may tell them what they think of their writing, especially if you take some time (as of course you already do) to show them how to do this constructively. But even if there is no discussion of your students' published efforts, they will see each other's work in an open forum that will provide new ideas for writing, as well as an appreciation of the potential variety of writing. Too often the lines of communication about writing run from each individual student to the teacher and back again. Broadening the web of participants enables the sharing of ideas. And publishing helps make the products uniformly presentable.

So try a variety of things. Recruit an older student, perhaps one who has just studied keyboarding, or a parent. Create and celebrate wonderful, finished products that testify to all your hard work and all your students' successes.

Another Word-Processing Method

It is difficult to use a single classroom computer for word processing. Although we know that students who write with word processing write longer pieces, revise more willingly and completely, and understand revision not as punishment but as improvement of writing, the scheduling problems too frequently defeat the teacher in the one-computer classroom. Some teachers try to circumvent this by asking their students to write their drafts with pencil and paper, and then the teacher types the students' drafts into the computer for them. Although students will lose some of the benefits of learning about word processing when this method is used, all is not lost. Conferencing and revision can still take place at the computer, and the method also this eliminates the process of "copying over," a mind-deadening task that invites the introduction of new mistakes. Another benefit is that students can easily get attractive final copies of their work.

When and How to Check Spelling

What about spell checking? Many writing teachers recommend that students postpone editing for spelling errors until they are ready for publishing. The theory is that young writers should complete their drafts without interrupting their train of thought to search a dictionary for a correct spelling. They can perhaps use placeholders or best guesses, but they need not attend to spelling accuracy until the final copy. In some classrooms, this may occur several weeks after students have begun a piece of writing, and it some cases it may never occur at all.

This approach to spell checking suggests that students learn correct spelling by repeatedly seeing words correctly spelled in print. However, students may also learn incorrect spellings this way. I once watched a student correct her persistent misspelling ("siad" instead of "said") 56 separate times with spell checking, and then misspell the same word one week later in her next piece of writing. What was going on here? I believe that she saw the word "siad" so many times that it looked right to her.

Handheld Spell Checkers

How can we help this student with her spelling skills and give her a chance to learn correct spelling in her own writing without slowing down her writing and stealing her ownership of her piece? If she writes using a word processor, spell checking at the end of every writing session will help and encourage her to make a sensible guess at a spelling because sensible guesses will probably be close enough to get the correct word in the spell checker's list of suggestions. However, in a one-computer classroom, another kind of technology also can help. The handheld spell checker is better than a dictionary, and cheaper, too. There can be several handheld spell checkers in a single classroom, and students can use them either as they write or after they have completed their writing to check their best guesses.

Like calculators, these electronic devices are smaller, cheaper, and more powerful than ever. In 1990, prices for these devices, which were roughly the size of a paperback book, ranged from $50 to $120. Since then, the size and price have gotten smaller. One company, Franklin, now manufactures the Next Century Webster's Spelling Corrector, which measures about 2 inches by 4 inches, contains 80,000 correct spellings, and costs $19.95. I found mine at my local supermarket, but I am told they are also available at discount stores, such as Staples, as well as other retailers.

This technology enables students to type in an approximation of a spelling and, if the spelling is incorrect, get a list of correct suggestions. Students can also type in a confusing word (such as "their") and get definitions for it and its homonyms ("there" and "they're"), thus helping them decide which word they should use. There are also two games, Hangman and Anagrams, on the Next Century spell checker, as well as a build-a-word function, which works with letter patterns.

What is the advantage of this handheld technology? Admittedly, a spell checker on a computer is better because it flags any word in the student's writing that doesn't appear in its dictionary. But handheld spell checkers may be the next best thing. In the one-computer classroom, this device gives your students access to useful help with spelling without tying up your single computer.

A good phonetic search engine in a handheld spell checker will offer the students the word "anything" if they type in "enything." (Try getting that sort of assistance in a regular dictionary!) Also, if students are encouraged to investigate correct spellings with a fast, helpful handheld spell checker as they write their drafts or at the end of each writing session, they will see correct spellings more frequently than incorrect spellings, and perhaps not get "siad" imprinted in their mental lexicons. Suggest a handheld spell checker to parents as a holiday gift for the child who struggles with spelling—it can only help.

Databases

Every tool works more effectively in certain contexts than in others. It probably isn't wise to teach knitting to a whole class with one set of knitting needles. However, quilting works well with one quilt and lots of folks working on it. Most of the activities in this book work well with one computer *because* there is only one computer in the classroom.

Databases lend themselves elegantly to the one-computer classroom, both for putting information in and getting information out. Let us begin by discussing how to get information out of a database. No, you did not miss the section on putting information into a database. That comes later. After years of teaching databases to teachers and students, I have found that working with prepared databases helps students learn what a database is and how one should be constructed. Just as reading lots of stories prepares students to write stories, using databases prepares students for creating databases.

Writing Selection Sentences

There are databases connected to many pieces of software. *A Field Trip to the Rainforest*, for example, has two extremely user-friendly databases, one of plants and another of animals. Using *A Field Trip to the Rainforest*, you can demonstrate for the whole class how to open the database and write a selection sentence, such as "find every animal that is a carnivore."

If you have only an integrated software package such as *Microsoft Works*, you will have to create a database for your students to explore. Choose a subject you plan to study and assemble a database of the most obvious facts about that subject. For instance, you could develop a database of states and include fields for the capital, the date the state joined the Union, famous landmarks, and the abbreviation of the state name. You can then teach your students how to use the Find feature to discover where Lincoln's home is located, where the Badlands are, or which states joined the Union after 1850. If you put in only 10 states or so, your students can research the missing states and learn how to add records in subsequent lessons.

You can establish this activity on a premise. The software company Sunburst Communications did this years ago with its *Climate and Weather* database. The premise was that clients would ask the database where they could go on vacation so that they could enjoy a particular kind of weather at a specified time of year. The state database you create could perhaps be used as a resource for tourists who wanted to plan sightseeing trips.

Another useful database is one that describes children's books. You can create a database with a bare minimum of information—author, title, number of pages, and kind of book—and then enter the information for a dozen books from the class library. Or you could ask the class members "How do you choose a book to read?" and create fields for the criteria they give. For instance, at a certain age, students choose books based on whether a book has chapters; there could be a Y/N field for that. Students also read books that other students liked, so there could be a character field for the name of the recommender. Create a form from the database fields and use it for "book reports" that the students must fill out before they enter their information in the database. Then teach them how to retrieve information so that they can find, for example, a book that has chapters and is about a horse.

Of course, you can use any database you have created with a previous class to begin teaching about databases with your present class. The one caveat is that you should not use a database that contains information about the students in your previous class. There is no reason to make any of that information available to other students.

Scaffolding the Activity

In your one-computer classroom, you need to very carefully scaffold activities when using the Find feature. Write a clear set of instructions, including what menu to pull down, what field to write in, what to write in the field, and so forth. I suggest that two students go to the computer together to do these activities—one to use the keyboard and the other to record what happened. Understand that they will have to talk as they work. Encourage them to exchange ideas but to do so quietly. One of the most striking findings concerning computer use in schools has to do with cooperative learning. Researchers have relearned an old, familiar lesson, namely, when two students work together on a shared problem, they do better than either one could do alone. This is also true at the computer.

At some point, interesting things may happen when working with databases. For instance, students may misspell a search parameter and not "find" what they were seeking. The class can then discuss how computers "find" items by matching strings of characters. Even an extra space will cause problems. This is a moment when the careful students will succeed and the less careful ones will have difficulty.

Why is this database activity valuable? You could certainly ask the students after they do it, but students who ask interesting questions of well-organized data will likely begin during the activity to see how those pieces of information might be related and why they might matter at all.

Entering Information

Information retrieval involves the use of higher order thinking skills. I believe that asking interesting questions and seeking the answers from a pile of information in a database is intellectually valuable. It requires that students articulate logical relationships and enables them to see why their information is important and how discrete pieces of information are related. Moreover it helps them understand that if database categories are not carefully defined, information is not easily retrieved (garbage in, garbage out).

Learning to put information into a database also has value. This is a particularly good use of one computer because you want to have all the information in one database rather than scattered in 20 separate but identically constructed databases. Hopefully, you will be working with a database has already been constructed, either by you or, even better, by the whole class after a thought-provoking discussion/debate (more about this later).

Classroom Management of a Database

Your database can cover whatever topic you address in social studies (e.g., states, presidents, countries, endangered species) or other subject area. It can be a database of children's books (a useful alternative to book reports). It can be a database of information about class members, either serious, including emergency contact information and allergies, or entertaining, like a "slam book" in which students record their preferences in movies, music, and food.

Once the database has been constructed, print out a form based on the database fields and photocopy many copies of it. Students can use the form as a guide for research. Having all their information on a form means that they will work efficiently once at the computer—they will simply be entering the material. Also, filling out the form provides an opportunity for the student to check spelling with someone else, either you or your resident spelling expert. Do not skip this step. It is critically important. If someone does not check spelling, everyone soon finds retrieval amazingly difficult.

If the database has just been constructed, enter a few records' worth of data and then try, as a class, to ask some interesting questions of the database. You may find that your database is not set up to provide answers to the questions you want to ask. If you discover this after a few records are entered, you can modify the form and try again. If you wait until all the information is entered, it may be more difficult.

Database Design Problems

In one of my classes, we found out that labeling a five-digit ZIP code field as a numeric field was not a good idea because the computer transformed all New Jersey ZIP codes by lopping off the nonsignificant zero at the beginning of the number. Social Security numbers, telephone numbers, and student identification numbers that include hyphens or other nonnumeric characters must be in character fields. You may think of them as numbers, but the computer does not.

Similarly, if you have a column for annual snowfall in your database of U.S. cities, it should probably be numeric so that you can sort on this field and find out where it snows least. But when you enter information, you cannot type in "25 inches." The database may accept it, but it will not properly sort it. A better way is to label the field "annual snowfall/inches," and then put only the number 25 in it. This is also true for height, weight, and age fields. Put the unit of measurement in the name of the field and only a number in the field itself.

Confusing numeric and string data can result in all sorts of interesting problems. For example, suppose a database of presidents had one field called "term of office" in which information was entered as "1789–1797." This database field is therefore a text string rather than a number, and will cause all kinds of difficulties in retrieval. A better structure for this data is to have separate fields for the beginning and end of the president's term. You would then be able to find out what presidents were in office when Hitler was in power in Germany (1930–1945). You could ask for every president whose term of office ended after 1930 (thereby assuring that you found every president who could have been in power) and every president whose term of office began before 1945 (thereby eliminating those presidents who were not yet in office when Hitler killed himself). See what an interesting logical exercise this can be?

A Problem With Dates

I found an interesting peculiarity in *Microsoft Works*, which I believe to be common to all databases. I created a database of Civil War battles, including date fields for the beginning and ending dates of the battle. I entered the dates in this form: July 1, 1863. When I tried to sort from earliest to latest battle, I got nonsense. The computer treated the dates as strings of characters rather than as dates, even though my format was seemingly acceptable. Finally, I changed the format to 7/1/63 and everything sorted just fine, but the prompt line at the top showed that the computer "thought" I meant July 1, *1963*.

I discovered that within a computer every date beginning with January 1, 1904, has a number attached to it, which is how the computer arranges things chronologically. Dates before that year give *Microsoft Works* a problem. Because all my dates were in the same century, I did not mind if the computer treated my 19th-century dates as though they were in the 20th century so long as it arranged them chronologically. However, my solution will not work if you create a database of presidential birthdays involving three centuries. If you do that, I suggest that you make two fields—a date field for the month and day, and a numeric field for the year. To sort chronologically, you will have to sort twice—first on the numeric field for the year and then on the date field to organize within each year.

Entering Names

Another important consideration is how you enter names. A good practice is to enter names in separate fields for first and last names. If you enter the president's name in one field with the first name first, you cannot alphabetize by last name. If you put in the president's name in one field with the last name first, you can alphabetize but you cannot print out the president's name as "George Washington." By using separate fields, you can alphabetize the database by the last name, and you can print out the president's name by calling for the first-name field first and then the last-name field. You may learn some of this as I did, by first doing it wrong. Therefore, fill in just a few records to see how your database works and then make changes, if necessary, before you enter all the records.

Getting to Know You

As an opening activity for the year, creating a database of information about students in your class(es) can enable you to become acquainted with your students and will help them learn more about each other. You can include useful information, such as emergency contact information and allergies. Those will be helpful to you. But you can also include information that the students might find interesting, such as nicknames, favorite rock groups, favorite junk foods, and favorite movie stars. You might even involve the students in the creation of the database categories so that they create a form that appeals to them.

Allow a week or so for each student to fill in his or her record in the database. You might find time for this activity as the class arrives in the morning, as students complete seatwork, or as you are doing individual or group testing. Provide a set of instructions by the computer so that students won't interrupt you with questions, or designate a class member as the resource person for database management.

A word of warning: Sooner or later some student will try using unacceptable words in the database just to see what you will do about it. One method of dealing with this sort of behavior is to say, "I thought you knew what behavior is appropriate in school. I'm so sorry you aren't grown up enough to have this much freedom at the computer. I like giving you the opportunity to be creative, but I guess you can't handle it. So I will find an activity you can handle." Then seek out the dullest drill-and-practice computer program you can find (typing tutors work well) and assign this student to work on it while everyone else is working on your more interesting activity. You won't have this problem for long.

Set aside some class time to review searching strategies in a database. Go over the procedures for sorting so that students can find out who is the oldest or tallest person in the class. Also review querying (finding) strategies so that students can find out about their classmates. If your database uses specific syntax for querying, have examples of that syntax available.

After the database is complete, browse through it and construct a few intriguing questions based on its contents. Some examples might be: How many students prefer pizza as their favorite food? Whose nickname is Ringo? Is there anyone in the class whose favorite rock group is the Beatles? Of course, your questions will have to be drawn from the particular information in your database. Encourage students to think up queries for the database.

If new students join the class in the middle of the year, their information should be added to the database. You can then construct questions that will provide a way for other students to get to know them.

How Computers Make Matches

Another valuable activity is to demonstrate how computers actually retrieve information. Students must realize that computers do not understand meanings and categories as humans do. Computers match strings of characters. If I identify pizza as my favorite food and you do too, then I can find every form where the favorite-food category begins with "piz." But if you identify "spaghetti" as your favorite food and we ask the database to find every record where the favorite food is Italian, neither of our records will be found. Computers don't "know" that pizza and spaghetti are kinds of Italian food unless we create another field for "kind of food" and put in the word "Italian." The computer will then identify your record and mine only if we search on this "kind of food" field and both have spelled "Italian" correctly.

Human beings do not think like computers, and computers certainly do not think like human beings—if computers can be said to think at all. Teaching students how to structure data in a database introduces them to the differences between our human understanding of the world and computer sorting and finding strategies.

A "Mystery Student" Activity

After you have constructed a database that contains information about your students, you can use that information for an interesting "Mystery Student" activity. This activity serves two purposes. First, it is an excellent way for your students to get to know one another and break the ice in a new group. Second, it provides practice for your students in working with databases and in sorting and searching for information in ways that computers "understand." In this activity, you essentially merge your student database with a form letter to create the "Mystery Student" material.

First, your database must have been created in some version of an integrated package. You can then write a paragraph in the word processor to describe a student, without using that student's name. It might look something like this:

> This student's nickname is _______. The mystery student really loves to listen to the music of the __________ while eating _________.

Of course, you will not use blanks in your completed word-processing document. Using the mail-merge function in the integrated software, substitute the name of the database fields for the blanks so that the word-processing document ultimately looks something like this:

> This student's nickname is <nickname>. The mystery student really loves to listen to the music of the <fav rock group> while eating <fav junk food>.

Merging the fields is fairly simple to do. In *Microsoft Works* for the Macintosh, for example, both the database document and the word-processing document will have to be open on your desktop. Position the cursor in the word-processing document where you want the first field to be merged (in this example, after "nickname is"). Then, choose Merge Fields from the Document window and select the appropriate field from the list of fields in the database. Continue until you have chosen all the fields you need. You may want to use a field more than once.

Microsoft Works, *ClarisWorks*, and *AppleWorks* can all be used for this activity. The process may be slightly different for each. Consult the Help menu in your program for the specific procedures.

You have now created a form letter. Now you need to fill in the form letter with only one student's information. To do so, return to the database and select only one student's record—design a query in which a student's name equals that particular student's name. Return to the word-processing document and choose the Print option. You will be prompted about merging fields. Say yes, and the result will be a paragraph in which database information has been incorporated.

Cute, but what do you do with it? You can, of course, use it as a mystery activity, which works particularly well if you add a field or two of information after everyone has browsed extensively through the database. Students can practice going back to the database and finding the student whose record has all the specified information.

You can also use the mail-merged letter as a language arts activity. You will probably get some strange constructions when the information from the database is merged with the paragraph. Inconsistencies in singular or plural usage may arise, and awkward constructions may result. For instance, if a student's favorite rock group is INXS, the sentence will read, "The mystery student really loves to listen to the music of the INXS." That should provide a chuckle.

Students can then look carefully at all the form letters and try to locate instances of awkward constructions. They can also construct their own sentences for this database activity and see what happens when information is merged into them. This activity may provide students with a new opportunity to examine the flow and rhythm of written language—some of which came from a database.

Creating Mad-Libs Using the Database and Word Processor

Mary (past tense of verb) the door. She saw a (name of an animal). It had (adjective) (color) spots.

Recognize this format? It's a Mad-Lib. Let's walk through the process of creating a Mad-Lib using the database and word-processing applications and the mail-merge function of any integrated program. This particular activity helps students learn parts of speech, especially grammatical terms and their referents. It can be an entertaining way to immerse students in this subject, and it requires only one computer.

To create a Mad-Lib, you must first choose a piece of text and type it into a word-processing file. This text can be a stanza of poem, a song lyric, a nursery rhyme, or a paragraph from a novel or textbook. If you want to focus on specific grammatical constructions, choose a piece of text in which these constructions occur. It does not matter whether the students are familiar with the material. They will not actually see this file until the Mad-Lib is printed out. However, if the text is familiar, the resulting Mad-Lib may be especially entertaining.

Naming Categories

Inspect the text and choose the words that will be replaced by Mad-Lib words. Find a category name for each of these words. For instance, "Plural noun—Pet" could be a category name in Mad-Lib.

Try to make your category names as clear as possible. If you are using *AppleWorks*, your category names will be the students' only clues to help them decide what to type into the database field. If you are using *Microsoft Works*, you can add text or provide examples to the database form to explain each field. The computer defines explanatory text on the database form as graphics, so it cannot be manipulated. The text only provides additional information for the user. Naturally, as your students become more grammatically fluent, you can gradually provide less explanatory text for your Mad-Libs, forcing students to rely on the grammatical terms.

Now create a new database comprising these categories. Students will type words into each field of the database, which will ultimately be mail-merged into the word-processing file.

Merging

After the database is set up, return to the word-processing file and use the mail-merge function to substitute database categories for each of the words you are removing. For example, if you used "Jack and Jill went up the hill," you could decide to replace "went" with a database category such as "verb form past tense." Depending on the integrated package you are using, your word-processing file would ultimately contain a line that looked something like this:

> Jack and Jill <verb form past tense> up the hill.

If students typed in "marched" in the database and merged the two files, they would see this sentence:

> Jack and Jill marched up the hill.

Here are several tips to make this activity go smoothly. First, your database form should include a field for each student's name so that individual students can choose only their own form to merge. Second, provide equitable access to the computer and clearly present instructions for this activity on one sheet of paper (either laminated or in a report cover) kept next to the computer. Set aside several days in which students can find 20 minutes to do this activity. Whole-group instructional time should be designated for discussion after everyone has done the Mad-Lib. In these discussions, students can hear each other's Mad-Libs and you can do some casual teaching about any unclear grammatical terms.

This may sound like a lot of work, but after you create a few Mad-Libs, you can show a few of your computer techie kids how to do it and let them write their own. By the time they reach fifth grade, all students should be able to create their own Mad-Libs. This means that they are identifying grammatical constructions, verb and noun forms, and types of adjectives and adverbs. This sort of language investigation can be engaging and highly educational.

Database Bells and Whistles

Database software lends itself particularly well to use in one-computer classrooms. Students can decide what information to collect about presidents, cities, states, countries, inventions, or books. The class can also design a database form. When the research has gotten under way, students can type their information into the computer and then ask the database interesting questions about relationships among bits of information in different fields. This process works best when all of the data is assembled on one computer. The process of creating and using a class database can start some fascinating discussions. Any database software will do, but *ClarisWorks* has several interesting new "bells and whistles." Among the most intriguing changes in the newer versions of *ClarisWorks* are the ways in which data can be formatted. The software presents so many different opportunities that it forces students and teachers to think about their data in new and different ways.

This is a far cry from the computer's great stone age (less than 15 years ago). When I first began to work with databases, data could be stored in just two forms: text and numbers. Subsequent upgrades have added a variety of data types, such as dates, times, logical (yes-or-no) fields, and even memo or comment fields. Popup menus, value lists, and checkboxes have become available.

Why Databases?

In the Information Age, students need to know how databases work in order to do any kind of research because more and more information is being stored electronically. Second, and more important, setting up databases requires students to use higher order thinking skills because they have to create and define categories (or fields) in the database. Setting up a database and retrieving information from it are intellectual exercises that require students to develop and use such critical-thinking skills as classifying, defining, categorizing, inferring, comparing, and contrasting.

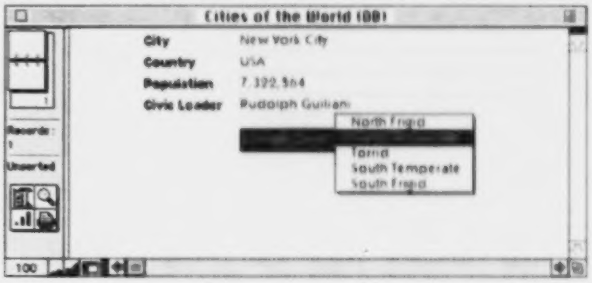
Organizing Data in Your Database

Within *ClarisWorks*, you can define a field as text, number, date, or time. You can also define a field as a popup menu, a value list, or a checkbox. (There are other options, but you can start with these.) Each field is useful for data that is structured in certain ways, so you must be clear about which data belong in which type of field.

Popup Menu

When you create a popup menu, you supply several possible values for that field by choosing a desired value from a list that appears on the screen. However, you can only choose a value that is already in the list; you cannot leave the field blank or type in something else. In other words, a popup menu is sort of a multiple-choice question: the choices are given and the user must select the correct one from among the choices.

When would you define a field as a popup menu? If you created a database of world cities, a popup menu would work for a field that identified the climate zone (North Temperate, South Frigid, and so forth) in which the city was located. The following figure illustrates how a popup menu works.

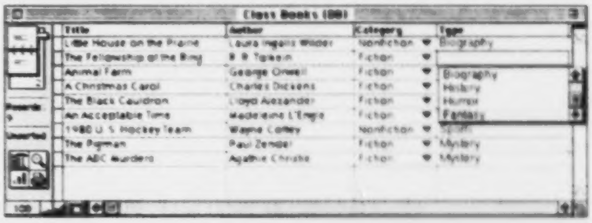


City New York City
Country USA
Population 7,322,564
Civic Leader Rudolph Guiliani

Value Lists

Value lists are slightly different from popup menus. When data is entered, a list of possible choices appears, just as in a popup menu, but other choices can be added or the field can be left blank. If a popup menu can be compared to a multiple-choice question, then a value list is comparable to a combination of multiple-choice and fill-in-the-blank questions.

Suppose your students constructed a database of books they had read and included a field for the type of book (mystery, sports, fantasy, humor, science fiction, or other type). Your entire class could brainstorm to come up with types of books before they created the value list. Then, when they entered their data on books they would see the list of established values and try to use one of the choices. The following figure shows how this works.

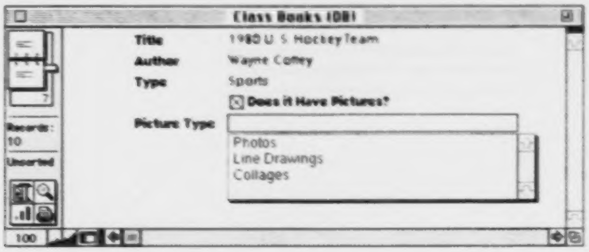


Title	Author	Category	Type
Little House on the Prairie	Laura Ingalls Wilder	Nonfiction	Biography
The Fellowship of the Ring	R. R. Tolkein	Fiction	
Animal Farm	George Orwell	Fiction	
A Christmas Carol	Charles Dickens	Fiction	
The Black Cauldron	Lloyd Alexander	Fiction	
An Acceptable Time	Madeleine L'Engle	Fiction	
1980 U. S. Hockey Team	Wayne Coffey	Nonfiction	Sports
The Pigman	Paul Zindel	Fiction	Mystery
The ABC Murders	Agatha Christie	Fiction	Mystery

It is critical that everyone knows how each type of book is defined. The database would be difficult to use for book suggestions if one student classified a book as fantasy and another classified it as a fairy tale. From time to time, students will read something that does not fit in any of the established categories. The value-list format allows them to type in their own classifications; if more books of that type are expected to be subsequently entered into the database, the new value can be added to the list in the field definition.

Checkboxes

Checkboxes are just what they sound like—yes-or-no fields. They can be used for items that ask questions; for instance, the field shown in the following example asks "Does it Have Pictures?" A checkbox field simplifies the process for data entry because the student need only click in the box. However, this field works only for yes-or-no data. If, for instance, you wanted to know what kind of pictures were in the book (photos, collages, or line drawings), you would have to add another field and define it as text or perhaps as a value list. The following figure shows a database entry using a checkbox and a value list.



Title 1980 U. S. Hockey Team
Author Wayne Coffey
Type Sports
☒ Does it Have Pictures?
Picture Type
Photos
Line Drawings
Collages

Creating and Using Class Databases

As students design databases to store the information they gather, they must consider how their data fits together and how to organize it in the best possible way. Different types of fields—such as popup fields, value lists, and checkboxes—can be used to make information easier to enter and retrieve. You should begin by asking your students what kind of information they will be getting and whether their classifications of the data will be self-limiting or more loosely constructed. These are neat questions, and they should provoke interesting discussions.

After students have discussed how to organize their data, you can get them started on creating a database. Instructions for creating a database in *ClarisWorks* are given in the Appendixes in the worksheet entitled "Creating a ClarisWorks Database." Similar procedures can be used for creating databases in other integrated programs. Use the Help features or user's manuals for guidance.

Spreadsheets

Spreadsheets enable students to manipulate numbers easily. Paulos (1990) argues that innumeracy, the inability to make sense from numbers, is a serious problem in America. Two problems appear to me. One is that our students do not understand how to manipulate numbers: how and when to add, subtract, multiply, and divide. A more serious problem is that students do not understand what numbers mean.

Students need to learn about numbers in meaningful contexts—and spreadsheets can help.

I want to be very clear. Spreadsheets will not teach students how to add, subtract, multiply, and divide. Teachers will have to do that. But as you instruct, you can also demonstrate how numbers work. For example, what happens if we double the price of fundraiser T-shirts, or if the interest rate goes up a point on a savings account, or if students score 20 points higher on their next exam? Spreadsheets can help students understand what those changes in numbers mean.

Getting Started With Spreadsheets

As with other applications, students can begin by tinkering with a preexisting spreadsheet. They can go to the one computer in your classroom with instructions to change one number in a particular place in the spreadsheet and observe what happens. The spreadsheet might be your gradesheet, in which scores are weighted, averaged, and then assigned grades from a Lookup table. You might have a spreadsheet that calculates the net profit for the class T-shirt sale based on the cost, selling price, and number of shirts sold. You can create a spreadsheet that calculates the cost of feeding an elephant in the zoo for a day, a month, and a year.

My students use a spreadsheet that demonstrates the relationship between the popular vote count and electoral vote count in a presidential election in the 10 states with the most electoral college votes. They change one state's vote count by one vote and find out that the electoral college has elected a different president! You, too, can design a spreadsheet in which the numbers have some dynamic relationship so that when students change something in one column, interesting things happen.

Another activity involves having students complete a half-finished spreadsheet by adding formulas to it. For example, one of my favorite classroom activities is to calculate a person's age in days, hours, minutes, and seconds. You can start by creating three columns, one for the person's age in years, one for any additional months past the number of years, and one for any additional days past the number of months. After students have completed the formulas for these calculations, have a group use the spreadsheet to convert the number of years and months to the number of days, and then total the number of days. Then have another group convert the number of days to hours, and so forth. At some point, the numbers will become too large for the width of the column and students will see ########## on their spreadsheets. Be sure to provide instructions for widening a column when this happens.

Finally, students can create spreadsheets of their own. For example, they can create a budget for the class trip or party, use the spreadsheet to double or triple ingredient amounts in recipes, or compare prices of specified items from several food stores. They can each research a state or country and combine their numeric information meaningfully. They can assemble data about endangered species or other environmental issues.

Every integrated package contains a spreadsheet program. For example, the spreadsheet in *Microsoft Office* is called *Excel*. Some spreadsheet packages, such as *The Cruncher*, from Davidson & Associates, are designed to be user friendly for younger students. Try one, and stamp out innumeracy in your classroom.

Chapter 3

Knowledge Organizers

A roomful of computers can be described as a set of workstations. Visions of students simultaneously working diligently on some intellectual activity at a computer—writing, graphing, running simulations—can evoke feelings of frustration in the teacher who has only one computer in the classroom. It is difficult to have only one "workstation," just as it is difficult to have only one microscope or one set of Cuisenaire blocks. But try not to be frustrated. Instead, think of the computer not as one insufficient workstation but rather as a "learning center," sufficient unto itself. In this chapter we will explore pieces of software that enable students to organize knowledge in a variety of ways and across a variety of content areas.

Timeliners as Knowledge Organizers

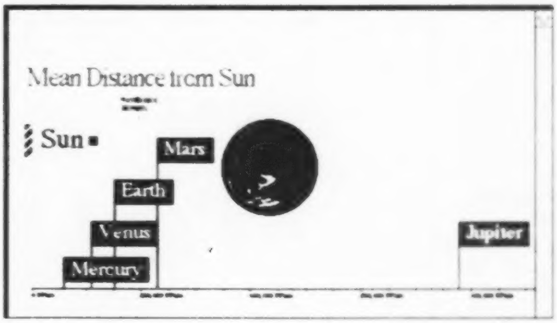
In the previous chapter, I described database activities that are best performed in a one-computer classroom. I have argued that collecting and organizing information in this way is well suited to the one-computer classroom. However, databases are not the only programs with which a group of students can organize their separate bits of information into a more coherent whole. Other types of programs, such as timeliners, can serve as knowledge organizers. One of these programs has already been mentioned: *Timeliner*, from Tom Snyder Productions.

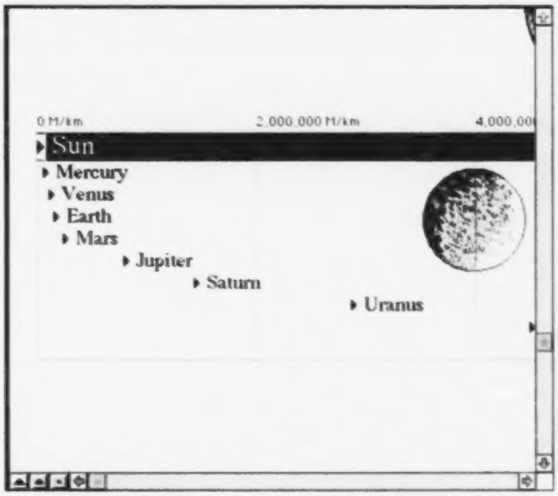
Timeliner, available for Apple II machines as well as for more powerful MS-DOS and Macintosh systems, is a tool for creating timelines. A timeline presents events in chronological order, which is one way of organizing knowledge. *Timeliner* enables students to illustrate the passage of time accurately, proportionally, and painlessly. They can use *Timeliner* to create a graphic representation of a sequence of events, including discoveries, inventions, and migrations. The possibilities are almost endless. The program provides an illustration of the distance (in terms of time) between two events, placing them in accurate relationship to each other. *Timeliner* can be used across the curriculum, in social studies, science, or English classes, or it can be used to map out the history of any other discipline. It can be used by young students and by high school students.

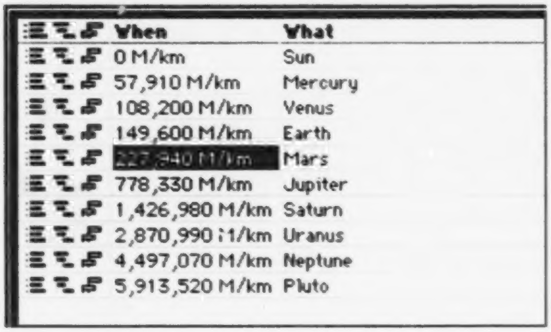
Younger students can enter their birthdates into *Timeliner* and see how long they will have to wait for their birthday party. They can also make timelines of the school day so that they will understand the flow of activities. Sequences of events from fairy tales can be entered into *Timeliner*, providing students with an understanding of the relationship of events in a story. Youngsters might also be encouraged to find out when their family first came to the United States and create a timeline of other family-related dates.

Students can research the achievements, discoveries, and inventions of various individuals, and then type information about these events into *Timeliner*. They can also assemble information about presidents or states and create a timeline of events in American history. The software makes it possible to merge two timelines, for example, one of historic events and another of scientific discoveries and inventions, thus allowing students to examine how these events and discoveries might have been related. Students can create timelines of historic events for several separate countries and then merge the timelines to examine relationships among the various countries.

Timeliner allows students to use of units of measurement rather than measurements of time. For example, they can create a "timeline" of the various planets' distance from the sun. Each planet is placed proportionally along the continuum, so students see a graphic representation of the relative distances of Mercury and Neptune. The following series of three illustrations shows how the data can be manipulated to produce various configurations.







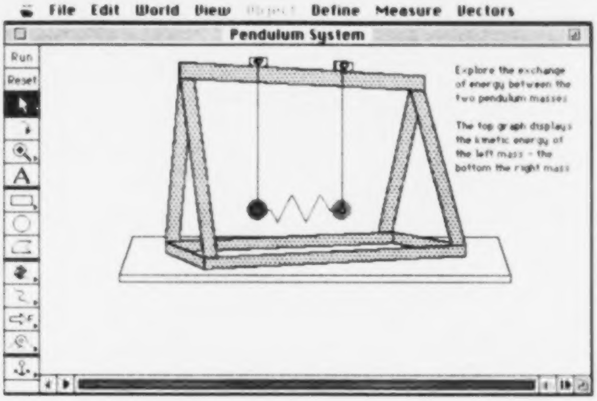
When	What
0 M/km	Sun
57,910 M/km	Mercury
108,200 M/km	Venus
149,600 M/km	Earth
227,940 M/km	Mars
778,330 M/km	Jupiter
1,426,980 M/km	Saturn
2,870,990 M/km	Uranus
4,497,070 M/km	Neptune
5,913,520 M/km	Pluto

The relative heights of mountains or the distance from Earth traveled by astronauts during manned space flights can also be charted.

When my son studied world history in seventh grade, his teacher asked each member of the class to choose, from the material covered in assigned readings, the event that marked the beginning of modern history. Each student defended his or her choice in class. A program like *Timeliner* could have been an excellent part of this lesson. The events could have been entered into the computer to create a sequence of events rather than remain as isolated dates and facts. If the students in my son's class had used this type of knowledge organizer, perhaps they would have better understood the relationships among events.

Other Knowledge Organizers

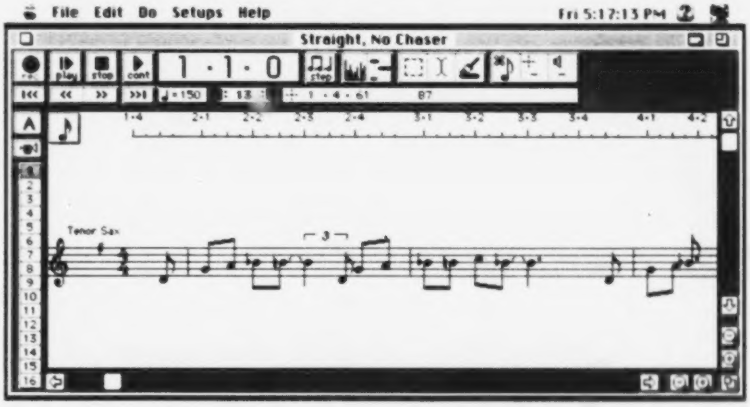
Here is an important question to ask when evaluating software: Does the software do something that would otherwise be impossible? Examples of software that answer this question in the affirmative abound. For example, physics simulations allow students to manipulate phenomena to demonstrate—and understand—important principles. The pendulum system shown in the following illustration demonstrates this point.



Explore the exchange of energy between the two pendulum masses

The top graph displays the kinetic energy of the left mass - the bottom the right mass

Music software with a MIDI interface can be used to transcribe notes played on a keyboard and then play the notes back on a variety of instruments, in different keys, and at different tempos. This kind of music software makes it possible to have your own orchestra instantly at your command. Here is an example from *Music Shop*:



Another way to evaluate software is to ask whether it makes it easier to do something that could be done off-computer. Again, a great deal of software is available to make routine tasks easier. Word processing makes writing easier, spell checkers simplify editing, and online encyclopedias provide multimedia links among topics across the alphabet.

Concept Mapping as a Knowledge Organizer

Another valuable activity for organizing knowledge involves the use of concept mapping, also known as semantic webbing or cognitive mapping. I use this kind of activity in a graduate course I teach at

Chestnut Hill College, but it can be used throughout the curriculum with students of all ages. Concept mapping provides a graphic representation of a student's understanding and requires the student to articulate the relationships among ideas and events. By analyzing a student's concept map, a teacher can know the depth and breadth of a student's knowledge, and so can the student. Concept mapping allows students to organize and reorganize their knowledge.

How can you use concept-mapping software in your curriculum? Let me count the ways. If you are teaching about the Civil War, students might create concept maps with topics such as causes, battles, leaders, or "firsts." In science, endangered species might be mapped according to topics like habitat, natural enemies, and area of the world. Geometric shapes might be classified in a concept map according to number of sides, kinds of angles, and so forth. A novel or a character in a novel can also be examined with concept mapping.

For students, the value of concept mapping lies in organizing knowledge graphically rather than verbally (which they frequently do by copying out of an encyclopedia). For teachers. the value lies in gaining an understanding of the extent of their students' knowledge. By looking over your students' concept maps, you can know what they know, and how they organize it. It is not necessary to test students to determine the extent to which their information has been articulated. The act of creating a concept map allows you (and them) to understand their understanding.

Doing concept-mapping activities away from the computer is the best way to begin. I have searched for materials that support off-computer concept-mapping, something that is sufficiently flexible and functional. Usually, I have settled on using pads of Post-its®, with one idea written on each; colored markers for drawing relational lines; and posterboard on which the Post-its can be moved around. This seems to work well, and I try to explain to my classes that these materials are "objects to think with" (Papert, 1980).

Concept-Mapping Software

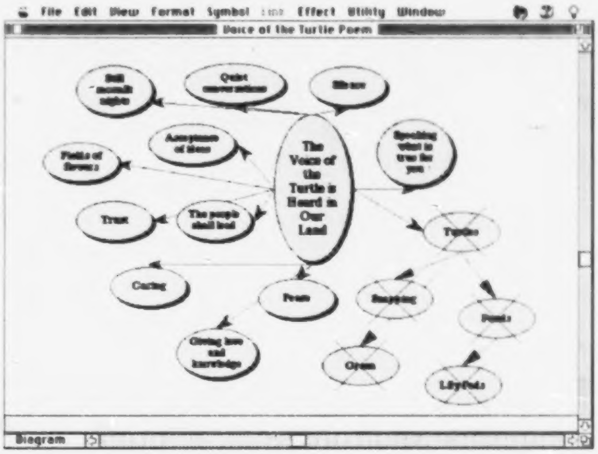
Building a concept map using a piece of software requires both propositional knowledge (i.e., what a concept map is) and procedural knowledge (i.e., how to create one on a computer.) It is difficult to learn a new concept and new software simultaneously, especially in a one-computer classroom, so separate teaching about concept mapping from teaching about the computer application. After students understand how concept mapping works, demonstrate the software to the whole class using a demonstration monitor or LCD panel.

Teaching students to use a powerful piece of software for concept mapping requires time and careful structuring. But the result is surely worth it. Like the process for other applications already described, the idea, in a nutshell, is to have students first explore a completed document created with the application, then work with a partially completed document, and finally create a document of their own from scratch.

I have seen several pieces of software that purport to do concept mapping, but most are so inflexible that I refuse to recommend them. When a piece of software distorts and delimits the activity so that it is less valuable than its off-computer counterpart, I will not use it. Unfortunately, many pieces of concept-mapping software distort and delimit knowledge in this way.

There are a couple of software programs, however, that do enable students to do good concept mapping. Two of these are *Inspiration*, from Inspiration Software, and *Expression*, from Sunburst Communications. *Inspiration* is available for both Macintosh and PCs with Windows. *Expression* is currently available only for the Macintosh.

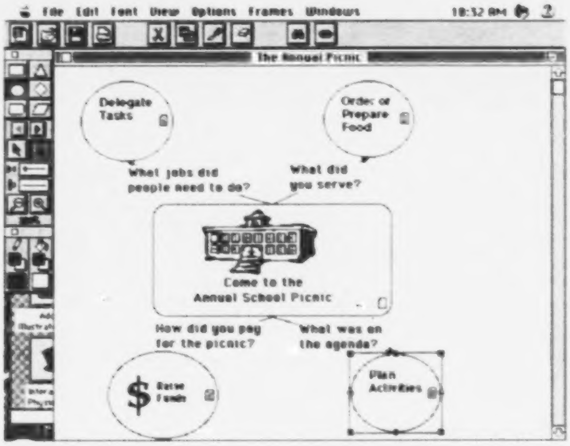
Inspiration is easy to use and creates attractive printouts of concept maps. It also creates flowcharts, tree charts, and outlines. The publishers do not offer previews but do allow returns. If you value concept mapping, you should find this program to be a worthwhile addition to your classroom software library. An example of a concept map generated by *Inspiration* is shown in the following illustration.



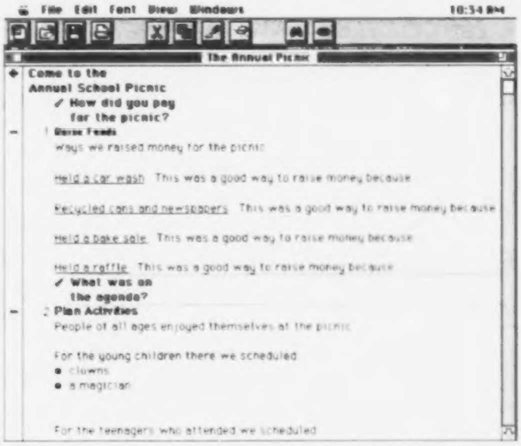
Concept Mapping With Expression

Somewhat more powerful than *Inspiration* is *Expression*, which has a number of useful features for representing ideas in graphic form. The software's tool palette offers shapes, text tools, and connecting lines, enabling students to create various graphic organizers, including semantic webs (concept maps), flow charts, and tree diagrams. Each of these structures lends itself to organizing particular kinds of information.

Expression enables students to connect main topics to subtopics with links, which are represented by lines ending in arrows. The direction of the arrows between concept modules shows how they are related to each other. Graphics can also be inserted into the concept map when it is in its graphic view. In addition, users can insert titles on every module and every link, and create notes that further explain their ideas. For example, in the following illustration from *Expression*, the note attached to the concept map is represented by the paper icon.



All of this material can be transferred to a text screen, and the text can then be reordered while maintaining the relationships among topics and subtopics. Here is a text representation of an *Expression* concept map.



Come to the Annual School Picnic

✓ **How did you pay for the picnic?**

1 **Raise Funds**

Ways we raised money for the picnic

Held a car wash This was a good way to raise money because

Recycled cans and newspapers This was a good way to raise money because

Held a bake sale This was a good way to raise money because

Held a raffle This was a good way to raise money because

✓ **What was on the agenda?**

2 **Plan Activities**

People of all ages enjoyed themselves at the picnic

For the young children there we scheduled
- clowns
- a magician

For the teenagers who attended we scheduled

Exploring a Finished Concept Map

Demonstrate the *Expression* software to the whole class by constructing a concept map on the computer that matches one the class prepared off-computer. Show the class the program's basic functions. Then send students in pairs or trios on a "scavenger hunt" at the computer. Using a completed concept map, have each group follow your specific directions to find some element of an *Expression* concept map, such as a subtopic, the contents of a note, or the title of a concept module. (There are some finished *Expression* files in the Activities folder accompanying the *Expression* software.) Have students keep a record in their computer journals of what they found and how they found it. The point here is to give students focused practice on opening and closing a file, opening and closing a note, and so forth. You can even ask them to change something and then have them save the changed version with a new name or extension so that they do not alter your original.

If you have to work with another group of students elsewhere in the room, try to make your directions as clear as possible to minimize interruptions. Another strategy is to preteach to three students, who then become "consultants" for the rest of the groups, leaving you to work on other projects. In any case, do not expect students to begin to use the software independently for their own work without some preliminary training. Sending them to the computer in groups not only speeds up this orientation process but also helps them help each other muddle through during the first session.

Using Templates for Concept Mapping

The next step is to create a template, a concept map whose structure you have created but whose content the students will create. For example. you could create a generic concept map for a report on a president of the United States by creating a central module and calling it "president." In the note for that module, you could sketch out for students what information to put in: dates of birth and death, length of term in office, and so on. Create other modules linked to the central module. These could be labeled as education, previously held elected offices, vice presidents, achievements, and so on. Indicate in each of the attached notes what sort of information belongs in that module. In doing this, you are modeling for students one way to organize a category of information.

Student-Created Concept Maps

Finally, your students will be ready to use *Expression* to create their own concept maps. Brainstorm at the chalkboard or with an overhead about ways to organize the topic, the possible subtopics that might be useful, and ideas for note contents. Do not send students to the computer until they can list their main topics and several subtopics. Have them print out their concept maps after they finish and let them use the maps to do their research. After they have collected some content—whether in the form of handwritten notes or reference material—let them return to the computer to insert it into their concept maps. When you have only one computer in your classroom, you cannot afford to have students doing their background work at the computer.

My final observation is this: If you go to all the trouble to do this with one piece of software, find other ways to use it across the curriculum and use it again and again. (This is true of databases and timelines too.) If you do, using software will become second nature to students—as it should—and they will add it to their set of intellectual tools. Let them have plenty of opportunities to use their skills to improve their assignments.

Puzzle Generators

Another kind of software that students can use to organize knowledge is a puzzle generator. The advantage of a puzzle generator is its ability to produce a finished product after the student has entered all the information. *Crossword Studio*, from Forest Technologies (for Macintosh and Windows), and *Classroom Toolbox*, from Sunburst Communications (for Apple II systems), are two such pieces of software. *Crossword Studio* creates an attractive crossword puzzle, with several options for background and typefaces. *Classroom Toolbox*, while designed for an older machine, is not quite as elegant but is actually more versatile and easier to run. It can generate crossword, matching, word search, word scramble, and multiple-choice puzzles all from the same bank of questions.

Other puzzle generators are *Puzzle Power* (available on CD-ROM for Macintosh and PCs), *WordPlay*, and *Worksheet Magic*. Here is a "quotefall" puzzle created in *Puzzle Power*.

I L M	 L	 T L	H O N	V E I	N E V	K L E	 R Y	 T	S H A	A E S	 E T	 A	 A I	 T	P R S	O H E	E E A
I	■	T	H	I	N	K	■	T	H	A	T	■	I	■	S	H	A
L	L	■	N	E	V	E	R	■	S	E	E	■	A	■	P	O	E
M	■	L	O	V	E	L	Y	■	A	S	■	A	■	T	R	E	E

Here are some shopping hints when looking for a puzzle generator: first and foremost, the program should be easy to use. *Learning* to use a piece of software should not be more time-consuming than actually using it. Remember that students should be able to use the software independently while you are working elsewhere in the room. On-screen prompts are helpful in keeping the process moving along.

Second, be aware of the limitations of the format. Two of my third graders wanted to create a crossword puzzle of states and capitals for their classmates. Fine, except that crossword puzzle generators cannot handle two-word answers with blanks—for example, North Carolina or Baton Rouge. This becomes a tricky teaching problem. Do you want students to write out these words without the appropriate spaces and perhaps learn them incorrectly, or do you reword the clue so that only one word is necessary for the answer? This is up to you, but be aware of the problem. Similarly, multiple-choice and fill-in-the-blank structures for *Classroom Toolbox* can read awkwardly in other formats. This may not produce a crisis; instead, it can be an opportunity to discuss how language works. Some puzzle generators allow you to generate your own alternative choices when you write a multiple-choice test. Surprisingly, some do not.

Suppose you have found a simple puzzle (or test) generator and know about the possible problems in using it. The real question now becomes: Who uses this software and why? Most puzzle and test generators are designed to be used by teachers for seatwork preparation. I hope you are groaning as you read this, thinking to yourself that your teaching is not about endless isolated seatwork. But all teachers know that it is harder to make a test than to take a test. Constructing questions based on a text is an intellectual activity that demonstrates an understanding of the text. Writing clues for a crossword puzzle indicates a grasp of word definitions. Students really have to think to write good clues and define words clearly. So let the students do it. Making the puzzle can be as valuable as solving it, maybe more so.

When I taught fourth grade, I had my students create crossword puzzles by hand. The only problem was their inability to make neat grids that interlocked properly. They spent most of their time on the grids, which is not my idea of an intellectual activity. Now, computers do the gridwork, and students can devote their energy to writing good clues—now there's an intellectual activity! Also, computer-generated puzzles and tests are necessarily anonymous because they are uniformly produced. No one student's puzzle looks better than anyone else's.

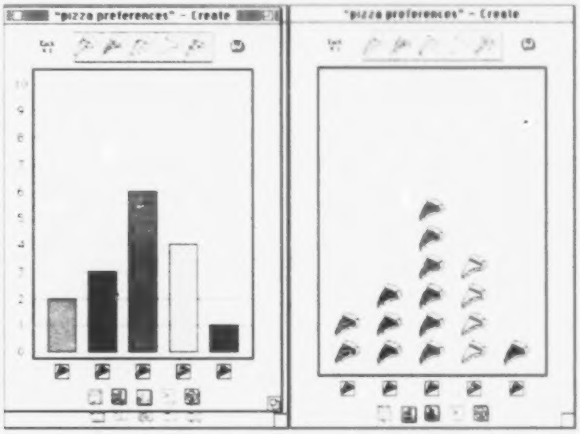
Here's one way to organize a puzzle activity. Create a list of spelling words, a set of facts or ideas, or a text you want students to learn. Begin by showing them an example of the product you want them to produce: a crossword puzzle, a multiple-choice test, whatever. Talk about the questions. Why were these questions asked? What makes this a good clue? Then ask the students to identify the important questions and write good clues from the information you want them to organize. You will have to teach your students how to use the software, so remember to find a program that is easy to use. Then let them form teams and have them write their puzzles collaboratively on the computer and print them out.

You can make multiple copies of puzzles and distribute them to the class to discuss and solve. The discussion is at least as important as the solution to the puzzle. Discussion should focus on the quality of the clues and the selection of information. Why would anyone care that Robert E. Lee's horse was named Traveler? Is that as important as where he surrendered? Let the kids kick the notion around a little; we used to call it "finding the main idea." The point is that students are organizing their knowledge in meaningful ways while playing with information.

Young Students and Graphing Programs

A single workstation can be conceptualized as a knowledge organizer, a place where students go to assemble, sort, and search their information in meaningful ways. Tom Snyder Productions publishes a book entitled *Great Teaching in the One-Computer Classroom*, by David Dockterman, that demonstrates the company's understanding of the limited distribution of computers in schools. Not surprisingly, Tom Snyder Productions designs many software packages for the following classroom configuration: one teacher, 30 kids, one computer. The computer is used to organize knowledge and assemble information (the tasks it does best) while teachers are freed to guide learning activities and present challenges for their students (the task they do best). One software package from Tom Snyder Productions that promotes this method is *The Graph Club*, which enables even very young students to create graphs and allows teachers to design units in which graphs are important.

Here's one way *The Graph Club* might be used. Survey the students in your class and find out how many kids like pepperoni on their pizza. (Even first graders can do this activity.) How many like their pizza plain? With extra cheese? Mushrooms? This might be useful information when you decide to have a pizza party on the last day of school. After you find out who likes what toppings, you can make picture, bar, or circle graphs of the data. An example is shown in the following illustration.



This activity can be done in the first grade? Absolutely. *The Graph Club* makes it child's play, pun intended.

As has been previously noted, Jerome Bruner (1978) has described a process he calls "scaffolding." Scaffolding is how parents support their children's informal learning, supplying sentence structures for their one-word utterances, reading to them until they can read for themselves, supplying the support they need, and gradually withdrawing that support as it becomes unnecessary. Like the temporary scaffolding on a building under construction, this intellectual support becomes superfluous as children begin to speak in complete sentences and decode printed text. Quality software for young children, like *The Graph Club*, is designed to support children's learning. Here's how that can happen.

Younger students can count the number of pepperoni, mushroom, plain, or extra-cheese lovers in the class and make a chart. Those who cannot yet count can click-and-drag an icon into the pictogram or bar graph, and a voice counts the number as the icon appears. Students get kinesthetic, auditory, and visual feedback about numbers. They can feel, hear, and see what the number 3 is. They also can compare it to any other number in the pictogram. The point is that they do not have to understand numbers to use the program. Using it will help them understand numbers, which will have some meaning for them because the numbers represent the pizza preferences of their classmates.

Of course, the software is not limited to pizza icons. Young students can be surveyed about a wide variety of topics. There are icons for holidays, weather, pets, after-school activities, colors, sports, and other kinds of foods. The package is designed for small groups of students working together (and scaffolding for one another). The software comes with four different sets of project booklets, beginning activities, and a teacher's guide.

A word of warning is perhaps necessary here. *The Graph Club* was written for younger students—and it looks that way. Older students (fourth graders, for instance) would probably reject it as too "babyish." I would not try to use it with them. However, if they really need the practice in learning how to build graphs, they might be willing to "help" younger kids do their projects with *The Graph Club*.

In a previous chapter, I addressed the necessity for classroom organization procedures that enable an orderly flow of students to and from the computer during the day, especially if one piece of software is being used by the whole class. The support material for *The Graph Club* suggests strategies for integrating this on-computer activity with off-computer activities, but the design itself makes the process simple. The actual computer activity is fairly quick and extends and illustrates the information-gathering that has already taken place. The computer is not used here as an enrichment game for the first kid who finishes arithmetic. It is a knowledge organizer, scaffolding valuable lessons about numbers and graphing.

Chapter 4

Teaching With One Computer in the Content Areas

This chapter presents ideas for using one computer in various content areas. It begins with a section written by Paula Rothman, technology coordinator of the Perelman Jewish Day School, on using the Internet in the one-computer classroom. She describes strategies for supporting students as they look for resources on the information highway, and she identifies Web sites that are useful to teachers and students.

The chapter continues with ideas and strategies for using CD-ROM resources (encyclopedias, atlases, and so forth) in conjunction with other resources in your classroom. The focus of this section is not on any particular encyclopedia or atlas but rather on how to select a CD-ROM encyclopedia or atlas and organize its use in a classroom with limited computer facilities.

Language arts software—CD-ROM storybooks, and reading and language arts game formats—is discussed next. In this section, I describe several pieces of software in detail. In doing so, I am not trying to sell any one piece of software; rather, I am making the point that there are many good software packages now available. Where I mention a particular piece of software, I do so to identify characteristics of quality software and provide some guidelines for choosing your own software.

Math activities using one computer, including math-related writing activities and math software, are also described in this chapter. Again, the specific mention of a piece of software is intended only to provide an example of software that is well designed. Next, I offer some suggestions for using one computer in the social studies curriculum, focusing especially on software and activities designed for whole-class use.

The chapter closes with a section on using one computer to carry out some group programming activities in Logo. I have taught Logo since 1985 and still find its possibilities intriguing. Finally, I discuss how one computer can support inclusion of students with disabilities in a mainstream classroom.

Using the Internet in a One-Computer Classroom

Suppose you would like to be able to use the Internet and World Wide Web, but you have only one computer and no modem in your classroom. Nevertheless, there is good news—you and your students can still use the Internet. And if you are lucky enough to be online in your classroom, you can also learn ways to efficiently integrate the use of the Internet with your single computer. If you have access to an LCD panel that connects to your computer or you can project your computer on a large TV monitor, you can bring the Internet to your whole class at once. Using a little creativity and careful planning, you can harvest the resources of the World Wide Web as well as participate in collaborative Internet activities.

If you do not have online access in your classroom, you will need to have access at another location, either somewhere in your school or at home, to bring information from the World Wide Web into your class. To use a graphical browser such as Netscape Navigator or Microsoft Internet Explorer to get information from the Web you must have a Point-to-Point Protocol (PPP) or the less frequently used Serial Line Internet Protocol (SLIP) connection through an Internet Service Provider (ISP). After you are connected to the Internet through your ISP, you can save Web pages that focus on specific curriculum. Using a program called *WebWacker*, you can save, or "whack," pages and their links to a floppy disk. (One of the problems with *WebWacker* is that if you "whack" a site that is too extensive, it may take you many hours to "whack" the entire site, and then it becomes too large to transfer to a simple floppy disk. If this is the case, you will need an optical disk that stores 100 MB or more of data.)

You can then use the disk to load the Web pages into your one computer and view them and their links as if you were online. This approach to browsing the Web requires your time to do some "mining" of the Internet to find what you are looking for. There are many fine educational Web sites from which you can start.

Another option is to learn to create your own Web page using Hypertext Markup Language (HTML) or an HTML editor. The simplest way to do this is to use Netscape Navigator Gold 3.0 or higher, which has a built-in HTML editor. When you find a page you want to save, click your mouse on the Edit button in the tool bar and you can save the entire page, background, graphics, and everything else into a single directory. However, if you are not online in your class, you will not be able to connect to the links unless you rewrite the HTML to link to files locally.

If you find a "keypal" or e-mail project in which you would like your class to participate, your class can use your one computer and a word-processing program to collectively write an e-mail message asking to join the project; save the message as a text file; attach it or copy-and-paste it into a mail program such as Eudora, Claris Emailer, America Online, or the mail program that comes with your browser; and then send the message using an online computer. The actual transmission of e-mail is rather uneventful. If your students are not familiar with e-mail, you can satisfy their curiosity one at a time by letting them see the mail being sent at the computer. Depending on their ages, you might assign your students who have e-mail access at home to take responsibility for "mailing" the message. This will hopefully show your students that the technology is really only a means for transmitting what is important: the ideas to be communicated.

Here are some Web sites for finding keypal projects.

Web Site Information/URL	**Description of Web Site**
Keypals—Links for All Educators Presented by Pitsco, Inc. http://www.keypals.com/p/keypals.html	This site contains information on listservs you can join to request keypals for collaborative projects or respond to messages from schools in distant lands. It also has links to other Web sites offering keypal exchanges, some of which are listed elsewhere in this table.
eMail Classroom Exchange http://www.iglou.com/xchange/ece/index.html	This site contains an online database of classroom information. You can search by school name, the classroom's first language, grade level, city or town, state or province, and country.
Intercultural E-Mail Classroom Connections http://www.stolaf.edu/network/iecc/	St. Olaf College provides mailing lists at this site as a free service to help teachers and students link with partners in other countries and cultures for e-mail-based penpal and project exchanges.
Rigby Heinemann Keypals http://www.reedbooks.com.au/heinemann/global/keypalt.html	This site lists messages from teachers who are looking for keypals. It also includes a "netiquette" guide for e-mail exchanges.

Web66 http://web66.coled.umn.edu/schools.html	This page connects you to an international registry of schools with Web sites. Special categories of schools include arts, charter, gifted and talented, special needs, international, math, Montessori, online, parochial, private, and science.

There are many ways to participate in an e-mail activity. By using several resources, such as Kid's Cafe on America Online, you can find other classes to "keypal" with. You can develop projects with distant classes, exchange stories or poetry, or write a never-ending story. You can brainstorm with your students and have them ask questions of students in other classrooms, with your own students taking turns composing their questions and ideas on your resident word processor. If your class is working on a specific curricular area, such as Native Americans or weather, you may find an expert on the Internet with whom you can set up an exchange. Several times each year, Judi Harris, from the University of Texas, runs the Emissary Project. The result is a database of subject matter experts, or "SMEs," with whom classrooms can apply to communicate. If your class is matched with a SME, your students can send weekly questions to the expert. In this ongoing dialogue, which lasts several weeks, it is only necessary for the teacher to have an e-mail address. The messages and questions generated by your class and the SME can be written off-line. To locate the Web page for this project, set your browser to http://www.tapr.org/emissary/.

If your classroom computer is connected to the Internet either with a modem or a (faster) ISDN or a T1 connection, you can make even more powerful use of the Internet. Your students should learn how to navigate the Web with a purpose. Although it can be fun at times just to see where the strands of the World Wide Web will lead you, it is best to approach the Web in a directed manner.

Directions on the Information Superhighway

There are several ways in which you can give your students direction. The simplest approach is to save bookmarks for the sites you have visited and want your students to visit. If you want to tackle creating your own Web page by using an editor or learning raw HTML, you can give your students guidance by embedding links to other sites into your own written work posted on the Web. You can present students with problems to be solved and lead them to links to sites where they can find the appropriate answers. This approach allows you to use class time on the Web more efficiently. You will also be able to provide students with a directed tour of specific Web sites. By using your own graphics or graphics downloaded from the Internet, you can create interesting pages that control online use. The HTML files you create can be saved on a floppy disk and shared with your colleagues, or, if your school computers are networked, the files can be shared via the network. To do this, you simply navigate to Open File under the File menu and navigate to the disk or directory where your HTML files are stored. These files can become part of your school's intranet.

If you have a fast connection (preferably a T1 line) into your classroom, one of the most exciting activities you can do with a whole class is to participate in a videoconferencing activity. By connecting a video camera to your computer, your whole class can see, in real time, another class anywhere in the world, and vice-versa. If you have the equipment and appropriate bandwidth, all you need is software called CU-SeeMe. CU-SeeMe is Internet video chat software featuring full-color video, audio, typed text, and data communications. (For more information, see White Pine Software in the publisher information.)

You can register your class and find other classes interested in videoconferencing through the Global SchoolHouse at http://www.gsn.org/cu/index.html. You may be able to get a free copy of CU-SeeMe through a no-cost membership in Global SchoolHouse. Videoconferencing is a very powerful way to open up the world to your students. Imagine studying about England and then being able to connect with a class of students across the ocean to learn from them firsthand! Videoconferencing may be time consuming to initiate, but once you have had success, you and your students will be hooked.

When you begin using the Internet in your classroom, keep it simple. You might want to begin with a weekly session. Using a single Internet activity is a good way to get your feet wet. You and your students must realize that no one controls or validates the information on the Internet; you must always look at any information with a critical eye.

There are many wonderful sites that will allow you to integrate language arts, social studies, science, math, and many interdisciplinary activities into your lessons. There are even sites that evaluate educational sites, organize them by subject area, and provide you with links to all the sites. Here are a couple to get you started.

Web Site Information/URL	**Description of Web Site**
ED's Oasis http://www.edsoasis.org/	This site provides links to what educators around the country recommend as the most engaging student-centered Web sites. It also provides examples demonstrating effective classroom Internet use from successful teachers.
Kathy Schrock's Guide for Educators http://www.capecod.net/schrockguide/	This site offers a categorized list of Internet sites that are useful for enhancing curriculum and teacher professional growth. It is updated daily to keep up with the tremendous number of new Web sites being developed.

Using the Internet in your class in a guided, controlled environment can lead your students to become independent thinkers, problem solvers, and researchers who are responsible for their own learning.

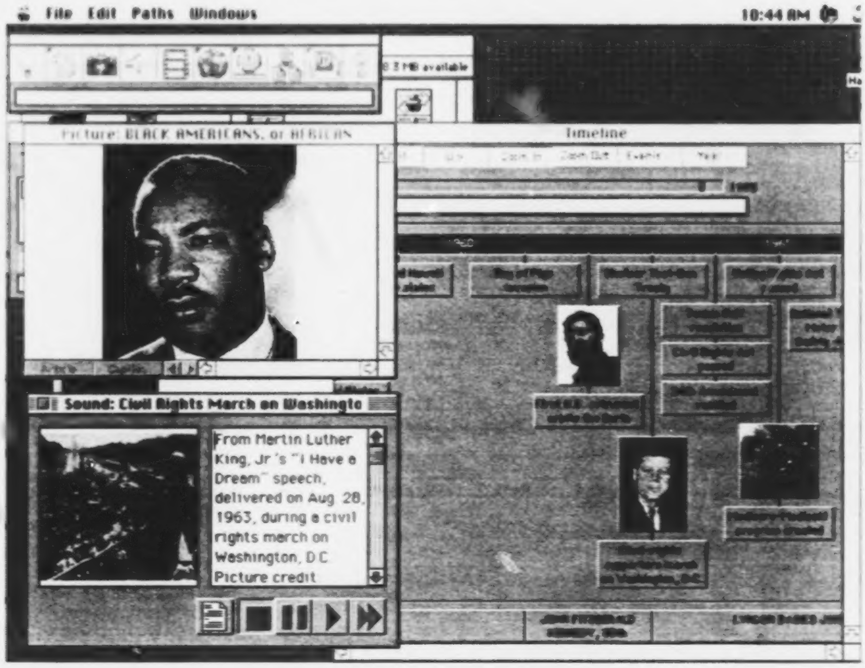
The Computer as a CD-ROM Research Center

I have spent some time (but not nearly enough) browsing through several different encyclopedias on CD-ROM. If you have never seen a CD-ROM encyclopedia, I urge you to do so. CD-ROM encyclopedias link media and technologies in powerful ways. They include audio and video clips, maps, charts, timelines, pictures, graphs, topic trees that graphically depict the organization of encyclopedia subjects, and note-taking spaces. They also provide built-in links between and among topics. The interactive design of a CD-ROM encyclopedia enables students to zoom in and out of maps and run videos repeatedly to watch, for example, the flow of blood through a human heart. However, you and your students need to understand the strengths and limitations of these tools and learn to work with them.

Reviewing CD-ROM Encyclopedias

Here are four points to consider when using CD-ROM encyclopedias. First, like most technologies, the price of CD-ROM encyclopedias continues to drop, and the quality continues to improve. I have learned the hard way not to be the first on my block to buy anything. The first on the block only gets to be first. Waiting means you will probably get more information and better performance for your money.

Second, each encyclopedia has its own unique features, links, information, charts, and graphs. If you can afford to have two different encyclopedias rather than two copies of one encyclopedia, take advantage of the opportunity. Each encyclopedia will have its strengths and weaknesses; each will cover some topics fully and others narrowly. As with any software, preview the CD-ROM before you buy it, inviting your students to try activities you want them to complete. The following screens from *Compton's Interactive Encyclopedia* demonstrate the text, audio, and timeline features that are available.



From Martin Luther King, Jr.'s "I Have a Dream" speech, delivered on Aug. 28, 1963, during a civil rights march on Washington, D.C. Picture credit

Third, choose an encyclopedia that works the way you want it to work. This means that if you do not want your students to hand you direct printouts from the encyclopedia as their research papers, choose an encyclopedia that does not allow them to print the material. If you want them to learn to take notes and print them, choose an encyclopedia with a note-taking feature. If you want them to understand how events are related, choose an encyclopedia that includes a well-written, fully developed timeline linked to text topics. If you value video and audio representations, choose an encyclopedia that has lots of those.

Fourth, remembers that a CD-ROM encyclopedia on one computer is only one research tool and can be used only by one small group at a time.

A printed encyclopedia of 26 volumes, one for each letter of the alphabet, can be spread around the classroom for simultaneous use, depending on what your students are researching. Each type of research tool has its own advantages and disadvantages and each is limited, by definition, to thumbnail sketches on any topic. Remind your students that much more information on any subject is available elsewhere. The encyclopedia is only a place to start.

Other CD-ROM Resources

In addition to an encyclopedia, you can provide other source material on your single computer so that your students can use the computer as a research center. The material on the computer, of course, should be supplemented by the other research material available in your classroom or in the school library. Some examples of other resources on CD-ROM are atlas programs, *Bartlett's Quotations* (which comes with *Microsoft Bookshelf*), and thesauruses. Scientific dictionaries, foreign language dictionaries, and music encyclopedias are also available.

Some CD-ROMs assemble resources on a particular topic, for example, artworks from museums of the world, David Macauley's *The Way Things Work*, and anatomy programs (*A.D.A.M. Essentials* and *A.D.A.M. The Inside Story* look particularly useful). Other examples of more narrowly focused CD-ROMs include Sunburst Communications' *Voices of the '30s*, which assembles audio, video, and text about the Depression; and Scholastic Press' *If Your Name Was Changed at Ellis Island*, which can be used in a unit on immigration.

No matter what topic you may want your students to research, there is probably a CD-ROM that can help them find out about it. For more ideas, see the list of educational software distributors in the Appendix and call them to request free catalogs.

Scavenger Hunts

As always, the question is how to use CD-ROM software efficiently in a one-computer classroom. This will involve some careful organization on your part. Your students may be tempted to browse indefinitely, idly looking for anything interesting. At times, this approach may suit your purposes, too. But if you want to focus your students' explorations somewhat, create a scavenger-hunt activity.

First, create a list of things you want your students to find on your assortment of CD-ROM resources. Suppose you are studying endangered species. The list could include two facts about a particular animal, a map or the coordinates of a place where the animal lives, the word for the name of the animal in another language, a quotation about the animal, some invention or scientific discovery that involves the animal—you get the idea. You can brainstorm with your students to create the list.

The value of this activity is that it requires students to use a variety of source material. They begin to understand that information comes packaged in many ways, and they develop the skills to locate exactly what they are seeking. You will have to discuss search strategies as a class, teaching students what a keyword does and what the icons mean. (For example, video and still camera icons indicate the availability of video and still photography, a microphone icon indicates an audio clip, maps icons link to an atlas.) Alternatively, you can provide a chart of the icons next to the computer with explanations of each icon. The user's guide to the software probably provides this information. Photocopy it and make it available.

Staging a scavenger hunt, or better yet, designing one with your class, helps focus everyone's explorations of your CD-ROM resources. Wandering can be pleasant, but in the one-computer classroom you may need to provide more direction.

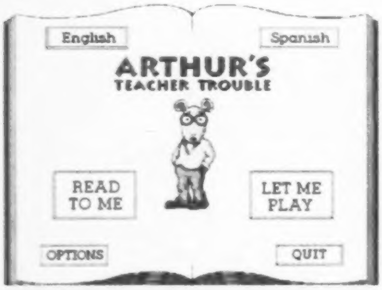
Using CD-ROM Storybooks at a Computer Reading Center

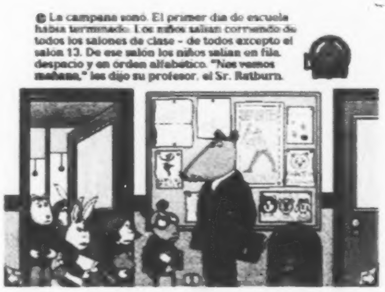
As has been noted, "scaffolding" is a term introduced by Jerome Bruner (1978) to describe what parents and teachers do when they read to children: They provide help and support to a student who cannot read and gradually withdraw that help as the student figures out how to read and no longer needs help. This help begins with reading aloud to model appropriate phrasing and expression, and it includes asking the student what might happen next, explaining the meanings of unfamiliar words, and making links between the pictures and the text. A single computer used as a classroom reading center with a selection of CD-ROM storybooks can also serve to scaffold your students' developing literacy.

Advantages of CD-ROM Storybooks

Books on CD-ROM represent one of the more valuable uses of technology and provide an experience for students that is significantly different from the experience of reading with other media. Like books on tape, CD-ROM storybooks are presented by expert readers who illustrate appropriate phrasing and read with expression. But unlike books on tape, CD-ROM storybooks usually highlight words or phrases as they are read, making it easy for a student to follow along. Like printed books, CD-ROM storybooks can be beautifully illustrated. But unlike printed books, the illustrations often act out part of the story when a student clicks on them. CD-ROM storybooks can incorporate music and sound effects, provide definitions of words, and even offer parallel versions in

Spanish or other languages. The following screens from *Arthur's Teacher Trouble* show how multiple languages can be offered.





La campana sonó. El primer día de escuela había terminado. Los niños salían corriendo de todos los salones de clase - de todos excepto el salón 13. De ese salón los niños salían en fila, despacio y en orden alfabético. "Nos vemos mañana," les dijo su profesor, el Sr. Ratburn.

CD-ROM storybooks often include related games, songs, or activities. Publishers are only beginning to explore all the possibilities for presenting quality children's literature on CD-ROM. New titles are announced regularly, with widely varying designs and increasingly attractive pricing. Many can be purchased for as little as $20.

Choosing Storybooks

Selecting CD-ROM storybooks can be tricky because the design options are so varied. How many extra activities do you want? Are they worthwhile activities, or do all the bells and whistles detract from the story itself? Is the presentation age-appropriate?

Preview the CD-ROM if you can, either by requesting a preview copy from the publisher or by using your local software preview center. Do some reviewing with your students, who can help judge which features are useful and which are not. Remember, a bad piece of software is never a bargain. After you have decided which titles you want, you can purchase them from educational discount resellers.

Some Favorite CD-ROM Storybooks

The CD-ROM storybooks described in this section are some of my favorites. (My students, too, seem to enjoy them!) If you start by using some of the titles I have already reviewed for classroom use, you can determine which features you like and which you don't like and begin to evaluate this type of reading material on your own.

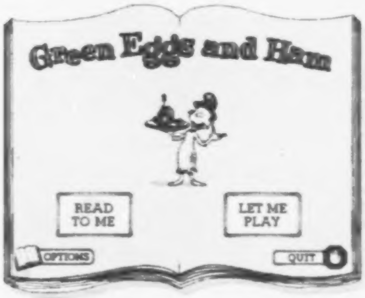
Discis Books, a publisher whose storybooks are available in affordable collections from several educational software distributors, are fairly straightforward presentations of folk tales and other familiar children's classics, such as *Peter Rabbit* and *Scary Poems for Rotten Kids*. The narration of the books is well done, and highlighted words and phrases can be pronounced and explained in English, Spanish, and, in some cases, Japanese.

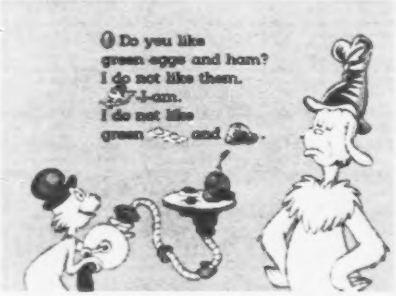
BEST COPY AVAILABLE

HarperCollins has produced *If You Give a Mouse a Cookie*, which includes a printed copy of the book along with the CD-ROM.

Davidson & Associates publishes *The Lie* and *Imo and the King*, both of which offer built-in explorations of the illustrations with just a click of the mouse.

Brøderbund Software brings its trademark sense of humor and imagination to *Just Grandma and Me*, *Arthur's Teacher Trouble*, and—my all-time favorite book—*Green Eggs and Ham*. A word of caution, though. Sometimes there is so much going on in a Brøderbund Software CD-ROM storybook that the story can get lost. The following illustrations show two sample screens from *Green Eggs and Ham*.




Do you like
green eggs and ham?
I do not like them.
-I-am.
I do not like
green and .

Using the Computer Reading Center

Using CD-ROM storybooks in your classroom may require a little planning. First, purchase inexpensive headphones and plug them into the computer. This will keep the entire class from hearing the book during one student's computer time. Another strategy is to read the printed version of the book to the whole class once, explaining and talking about it as you go. Then students can revisit the story during their individual computer time, perhaps gaining new insights and improving their reading skills. In fact, CD-ROM storybooks may be better able to hold students' attention when students are already familiar with the story. Also, have a printed version of the book available in the classroom for students to review. Good books invite students to read and reread for practice and pleasure.

CD-ROM storybooks may simply allow your students to read or listen to the story in a linear manner, or they may be more interactive. I suggest that students read the story once all the way through before they explore the more "playful" options. You can also provide 3" x 5" cards for students to jot down any new vocabulary words they find. They can also describe their favorite part of the story in their journals (remember those?). And, like any piece of literature, CD-ROM storybooks can be used for a wide variety of response-to-literature activities, both on and off the computer.

Reading Skills in Game Formats

Whole-language advocates argue for meaningful reading contexts. Computer software can provide meaningful contexts, e.g., instructions for using a game or clues for finding a criminal in a mystery. Meaningful contexts help students develop their reading skills. So what sorts of reading activities on computers might be valuable in your curriculum? This section looks at examples of two kinds of reading games, one about award-winning children's literature and the other about reading strategies. Both use texts in which students are expected to find answers.

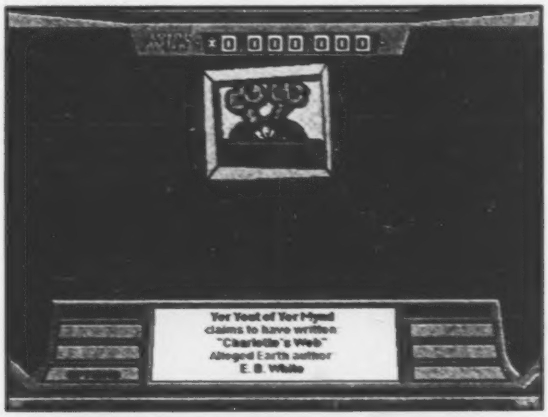
Answers are what reading is all about. We read to get our questions answered (Smith, 1996). The question may be as simple as "What happens next?" or as complicated as "What was the purpose of the Gettysburg Address?" We read to find out something. Our success in this endeavor depends on the author's ability to communicate and our own ability to make sense of that communication. There are some pieces of reading software currently available that use well-written texts to provide students with practice in word and language investigation.

Why do we urge our students to read what we consider to be quality texts? Because these materials answer our questions in illuminating ways. The content is worthwhile. It is also true that quality literature is written well, so we can easily get the answers to our questions. The information is well presented. To become good readers, then, our students need to read quality texts, both to learn about the world and to learn about reading and writing.

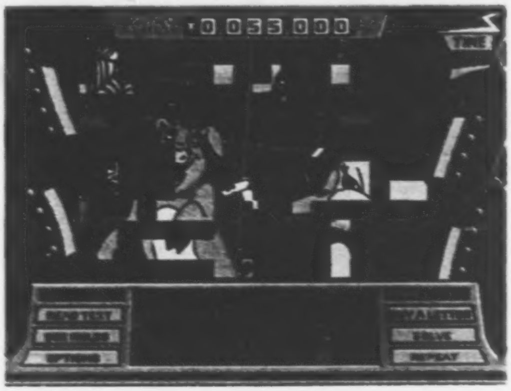
The argument can be made that all software is reading software because—except for preschool software—there are instructions and dialog boxes in every program. Students must learn to read this material in order to manage the software. But there are some interesting resources available that were specifically written to help students develop their reading skills and strategies. The following discussion examines two of these and identifies those elements that might make them valuable additions to your software library. Both of these pieces are for middle school students, and are useful, perhaps, for strong third-grade readers up to seventh or eighth graders who need help. The texts are either from Newbery award-winning fiction or from high-interest fiction and nonfiction written for this age range. The presentations are sophisticated rather than childish.

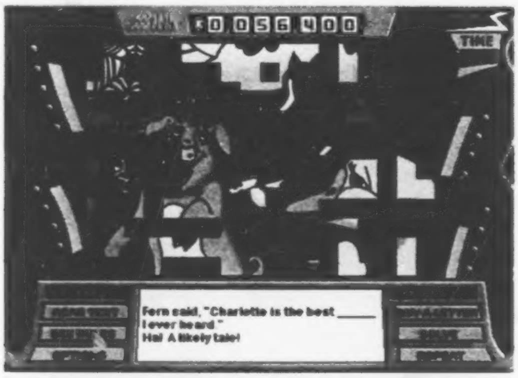
Middle School Reading Games

Reading Galaxy—Featuring the Alien Tales Game Show, from Brøderbund Software, has a quiz-show format. The mildly outlandish premise is that a number of aliens (six, with very punny names) claim to have written classic pieces of children's literature. The student's job is to answer questions about a specific book and therefore prove that the alien could not have written the book. Selections from 30 children's books are available, and the user (or the teacher) can choose the book(s) for the quiz. The student accumulates points, wins rounds, and, at designated levels, engages in a lightning round, sifting through information about the author in a "matching" format. (A text is made available so that students can look up the answers if they do not know them.) The following five screens give some idea of the activities offered in the program.

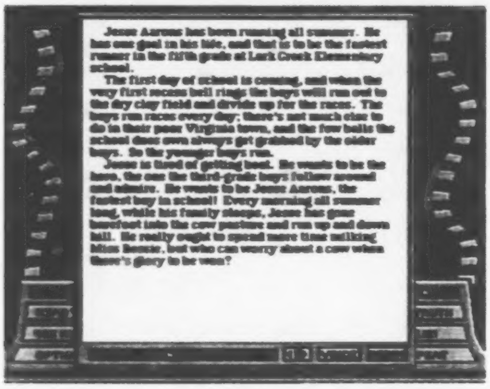


Yer Yeet of Yer Mynd
claims to have written
"Charlotte's Web"
Alleged Earth author
E. B. White





Fern said, "Charlotte is the best ______ I ever heard."
Ha! A likely tale!



Jesse Aarons has been running all summer. He has one goal in his life, and that is to be the fastest runner in the fifth grade at Lark Creek Elementary school.

The first day of school is coming, and when the very first recess bell rings the boys will run out to the dry clay field and divide up for the races. The boys run races every day; there's not much else to do in their poor Virginia town, and the few balls the school does own always get grabbed by the older boys. So the younger boys run.

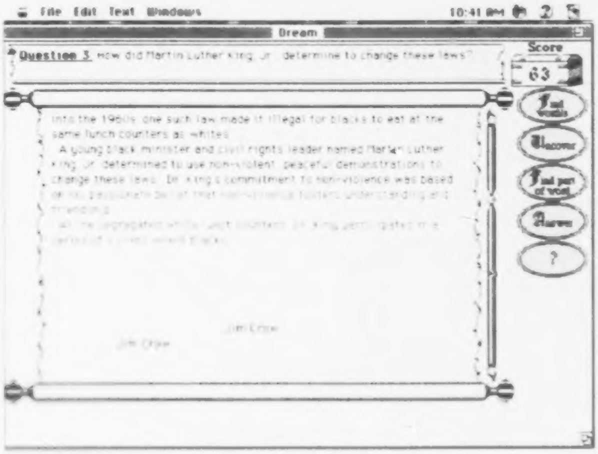
Jesse is tired of getting beat. He wants to be the hero, the one the third-grade boys follow around and admire. He wants to be Jesse Aarons, the fastest boy in school! Every morning all summer long, while his family sleeps, Jesse has gone barefoot into the cow pasture and run up and down hill. He really ought to spend more time milking Miss Bessie, but who can worry about a cow when there's glory to be won?

What elements does this software have that make it worthwhile? The most valuable feature, to my mind, is that it presents a question about something that happened in the book and then provides the text if the student contestant wants to look up the answer. There is no penalty for looking up the answer. This, it seems to me, is as it should be, for do we want our students to remember some trivial fact about a book or be able to find that fact in the text when they need it? Also, the activity of looking up the answer guarantees that students will be reading the literature and winning the rounds. This structure invites students to learn even as they are taking the quiz, and it provides the support to make learning possible, and fun.

You could use this software to review a book after the whole class has read it, but it also could be used to whet students' appetites for stories they have not read. For instance, you could introduce a book that the whole class is going to read, invite students to play a round or two, and then discuss as a whole group what the book might be about. The software also includes a variety of puzzles and game formats, including a Wheel of Fortune type of game. Students become engaged in word play and language investigation, reading for information and for meaning. Like many Brøderbund Software products, it is written with a quirky sense of humor, corny but appealing.

In the one-computer classroom, you will have to limit the number of rounds students can play, or they may be at the computer for quite a while. You can require that they record new vocabulary or information they find, either about the book or the author. They can then discuss as a group what they have learned, and share the wealth.

What's the Story?, from Logal Software, provides another interesting game format for building reading skills. This software presents a blank screen that hides a text selection. The teacher can choose the text from a list of fiction and nonfiction topics. Then the student plays the game without knowing what the text is about. The computer presents a question whose answer can be found in the text. The student can ask the computer to uncover some key word, probably a word that appears in the question. The software uncovers every instance of that word, and the student can then choose to highlight the text surrounding an instance of that keyword. (Questions are presented in sequence to accompany the text, so the student should proceed from the beginning to the end of the text.) If the student has chosen well, the answer to the question will be in the text that has been uncovered and the game proceeds to the next question. Students accumulate points based on the amount of text they uncover. The more text they need, the fewer points they get. This discourages students from simply highlighting the entire text and then answering the questions. They could play the game that way, but their scores would be significantly lowered. The following is a sample screen from *What's the Story?*



Question 3 How did Martin Luther King, Jr. determine to change these laws?

into the 1960's. One such law made it illegal for blacks to eat at the same lunch counters as whites.

A young black minister and civil rights leader named Martin Luther King, Jr. determined to use non-violent, peaceful demonstrations to change these laws. Dr. King's commitment to non-violence was based

Students playing this game look for context clues in a focused way, learning to read for specific ideas and becoming aware of strategies for finding information in texts. This software develops students' ability to locate specific information in order to make sense of what they have read.

Choosing Reading Software

What, then, are the qualities that make a piece of reading software valuable? Here are three guidelines.

1. The design of the software should support students' learning, providing resources so that students can look up answers. The software should discourage guessing and allow time for students to think about the issue and discuss it. (This precludes a time limit on a game—reading is not about speed.)
2. Questions posed in the activities should be interesting and important. New vocabulary should be emphasized, and information critical to the plot or character development should be highlighted.
3. Scoring should not penalize students for looking up an answer but should encourage them to focus.

Reading Galaxy—Featuring the Alien Tales Game Show and *What's the Story?* are two examples of software design that use quality texts to help students develop reading skills and strategies. There are many others. I invite you to preview the ones that seem to offer something for you and your students. As you preview them, consider whether they encourage the reading behaviors you value.

Learning Language Arts Skills in Game Formats

Yes, let's talk about language arts skills. Whole-language advocates argue for authentic language activities drawn from students' reading materials and individualized for their specific needs. The theory is that students learn to read by reading high-quality literature and learn to write by writing on a regular basis about what they know best. No one really believes that doing endless seat work on isolated skills will by itself enable students to read.

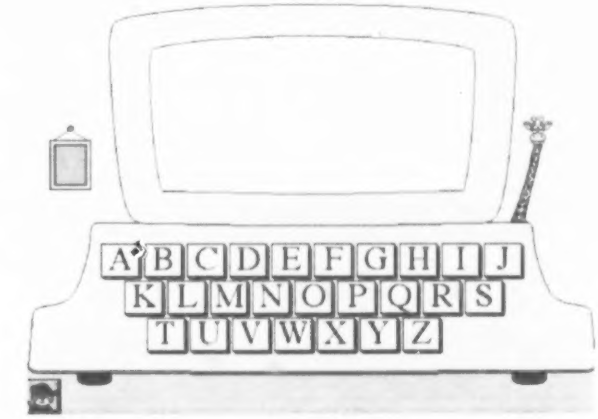
But sometimes a little drill-and-practice can help students learn to track sound to symbol, with multisensory approaches. Beginning readers and writers can write invitations and stories when their activities are adequately scaffolded. Students can play games with their vocabulary words and become familiar with their meanings and spellings. In short, games provide practice and instruction, scaffolding and supporting youngsters' literacy development.

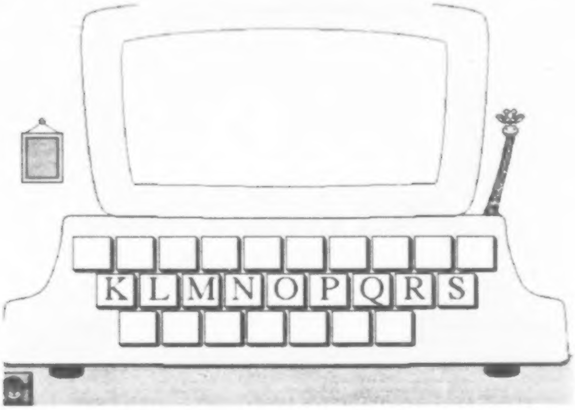
Previewing Language Arts Software

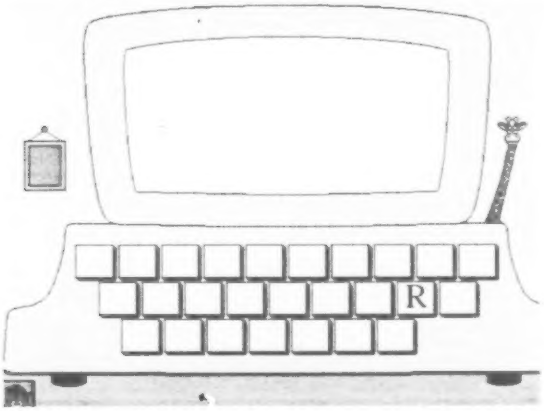
Previewing a language arts game is critically important. You need to examine the software very carefully and ask some basic questions: Is there any teaching going on or is the software only testing? Does it keep score and, if so, what rewards does it offer? Is there an opportunity for students to figure out the correct answer, or do they just have to know it? What happens when the student gives an incorrect answer? And, fundamentally, does the software reflect your beliefs about the teaching of reading and writing? Only you can answer these questions, by sitting down, alone or with several students, to use the software.

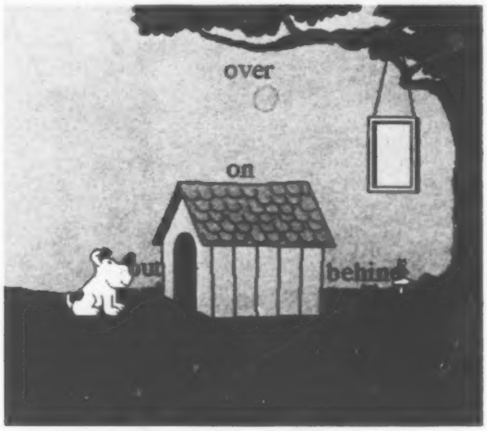
The following discussion describes several language arts software games I regularly introduce to my graduate students. The descriptions raise some issues for you to consider. Whether you choose to use any of these is entirely up to you. My purpose is to point out some features that merit mentioning, and leave you to judge for yourself about the usefulness of the software.

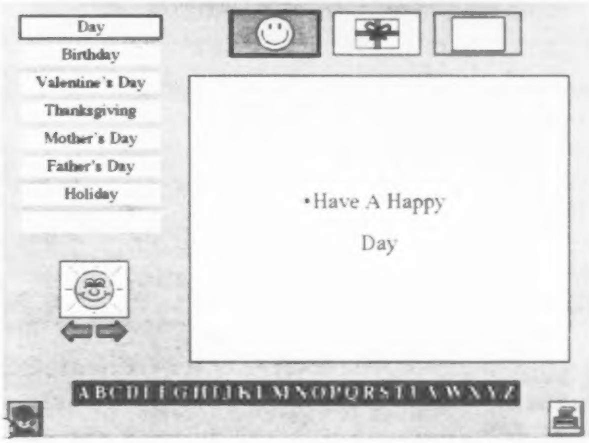
Bailey's Book House, from Edmark, presents several language arts activities designed for beginning readers from preschool level to second grade. For this age group, software should be designed (as *Bailey's Book House* is) without text instructions on the screen. After all, the point of the software is that it is designed for young students who cannot read. The software should have a consistent format, as *Bailey's Book House* does. There are two levels of most activities, and the student switches between them by clicking on a picture in a frame. Software for this age group should be colorful without appearing cluttered. It should also make use of sound and movement, read for the student whenever appropriate, and direct rather than distract the student's attention. The following screens demonstrate some of these principles.











•Have A Happy
Day

Navigating through *Bailey's Book House* is simple and flexible. Icons on the bottom of the screen enable students to leave any activity and return to the main screen when they are finished. Similarly, they can click on icons to have a story read or printed out. This user-friendly design is crucial for younger students. They should be able simply to point-and-click, and they should be able to figure this out by trial and error and by looking at icons.

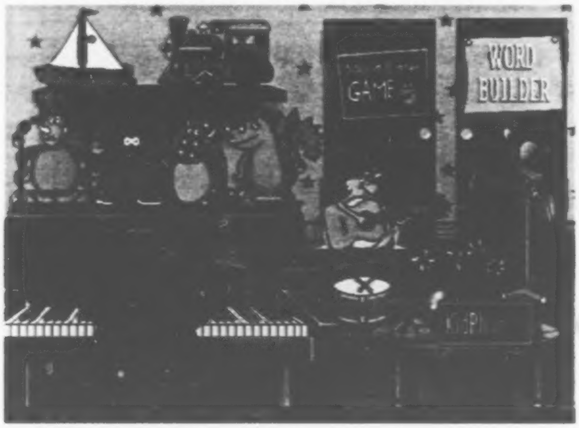
Does the software teach rather than test? In the rhyming game in *Bailey's Book House*, rhymes are read. In the challenge form of this activity, a student chooses a word and the program reads that word in the rhyme so that the student can hear it. In the preposition game the meanings of prepositions are demonstrated, and in the challenge activity the words appear in appropriate places ("under" is printed under the doghouse, "in" is printed inside the doghouse), thus illustrating what each word means. Every activity has a teaching level, but even the challenge activities furnish information.

What happens when the student answers incorrectly? The designers of *Bailey's Book House* have handled this issue well in those activities that have correct and incorrect answers. Each time the student selects a wrong answer from several choices, the software narrows the choices until, after three or four wrong answers, the student can choose only the correct answer. At that point, the congratulatory message appears, just as though the student answered it correctly the first time.

Beyond the technical issues, what language arts activities are included in *Bailey's Book House* and are they activities you want your students to do? *Bailey's Book House* has five activities on the disk version and six on the CD-ROM. The disk version enables students to write invitations, gift tags, and cards; create a story from a selection of elements; learn about rhymes or prepositions; and learn the keyboard and sound-symbol relationships. The CD-ROM version has additional options in each of these games, and has a word building game in which students can assemble words from parts. They can, for instance, make words by pairing an initial consonant, such as "b" or "c," with the syllable "at" to make "bat" or "cat."

You can choose the activities you want your students to do with this software or let them explore for some limited time. It would be easy to have all students make a greeting card, print it out, and then color it in. This could be done fairly quickly in a one-computer classroom. Pairs of students could play the preposition game once and then draw a picture that illustrates one of the prepositions.

Kid Phonics, from Davidson & Associates, is for the same age group but is focused on teaching sound-symbol correlation and discrimination among sounds. The opening screen presents singers in several styles (rock, country, rap), with the words to their songs appearing on the screen as the performers sing them.



This can be valuable reading practice for your students, especially those who need support (perhaps an ESL student or one who is very slow getting started). There are game formats in which students are asked to match a sound. They can listen to the sound over and over again, as often as they need to, and when they match the sound correctly a piece of a puzzle is revealed.

I love the "ch" in "chow,"

Kid Phonics may not be useful for every young student, but it may provide multisensory practice for those who need it.

For older students, Davidson & Associates offers *Word Attack*, which presents several word-game formats, such as crossword puzzles and jumbles. If your students enjoy these word games or need vocabulary practice, this piece of software can be quite valuable. It comes with grade-level-specific word lists, including a vocabulary list for SAT practice. It also will accept a list of words and clues from the teacher and use them in its formats. This means that the software can be used with many grade levels and with any word lists. In fact, its structure is sufficiently dignified that even my graduate students can use it without feeling silly. It could be used to introduce vocabulary in science or social studies (single words only, please—"gene pool" or "electoral college" will not work in this format). Of course, your students can also submit words and clues. You will have to oversee their word choice and definition choice, making sure that they use appropriate language for a school setting.

Each of these programs helps students develop their language skills. Each one uses several game formats to engage students' interest over time. They will not "use up" the software after one session. They can generate a variety of stories, invitations, and cards with *Bailey's Book House*. They can explore many word patterns with *Kid Phonics*. And *Word Attack* can be used with any word list, making it appropriate for any age group or topic. Each piece of software helps students get the right answer rather than trapping them in cycles of failure if they do not "know" the answer. As you look at game software for language arts skills, consider whether these features are in the software you are previewing.

Math as Writing

In everyday life, mathematics rarely occurs in the form of worksheets of calculations. When we need mathematics, it is usually to solve a problem that arises. If I need 1 cup of rice to make rice pudding for 4 people, how many cups of rice do I need to make rice pudding for 20 people? If I have 14 cans of soda, how many more do I need to have two dozen? How many 4-inch pieces can I cut from a 37-inch board? Students have difficulty with mathematics in this format and can certainly use practice in reading and understanding story problems.

Here's an idea for providing this kind of practice. It involves both writing and problem solving in your one-computer classroom. Have your students write story problems for each other in round-robin fashion. First, have a student (or pair of students) type a story problem into a word-processing program. The student must formulate the problem, providing enough information to solve the problem. He or she can use boldface or italics for any key words that help other students figure out the correct operation (e.g., "how much less," "how many times"). This activity provides practice in thinking about the format and words of a story problem and in attending carefully to their meanings. Next, other students attempt to solve the problem, writing out what they would do and why. They might use a calculator to carry out the actual mathematics operations or type in the problem and solve it on the screen. You can decide which method works best for the problems your students are writing and solving.

Finally, the solvers get to write a problem for the next student or students to solve. This activity can continue over several days during math time until everyone has had a chance to write and solve a problem. If you save the word-processing file, you can discuss particular problems with the whole class, or use a particular problem on a test of your own after changing the numbers.

There are intriguing variations on this theme. You can require that the authors of the problem have a solution available. You can require all students to write story problems that involve a particular operation they need to practice. You can have one group describe its method of solving a problem and then send members of another group to the computer to decide whether they agree with the first group's method—and then have each group calculate a solution. If an especially lively disagreement arises, the whole class can discuss which method and which solution seem to be right.

One of my graduate students presented story problems to her fifth-grade class and required that they use calculators to solve the problems. In fact, she required that they use the numbers in the problems in addition, subtraction, multiplication, and division calculations and then decide which of those calculations made sense. Her point, of course, is that students must make sense of numbers rather than do mindless calculations. We have computers for doing the mindless part.

Students who make connections between words and numbers will begin to understand the elegant logic of mathematics. This activity provides an opportunity to do just that.

Math Software in the One-Computer Classroom

Mathematics software, more than software for any other content area, runs the gamut of instructional approaches, from drill-and-practice to problem solving to demonstrations of mathematical relationships. It can be used with a large group to present a problem, and students can then describe their strategies for solving it. The class can watch as you demonstrate the use of the software. Small groups can go to the computer to use problem-solving software or to enter data into a spreadsheet program. Individual students can use the computer for reinforcement and remediation or for well-structured explorations with clear instructions and goals. Software activities can help students appreciate the elegance and symmetry of mathematics and the pleasure of solving difficult problems

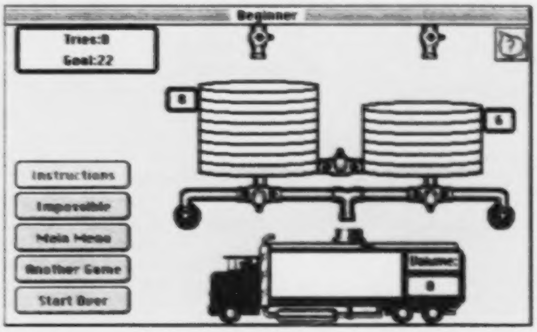
Game Formats

Game formats that enable students to figure out the answer rather than take an uninformed guess are the most educationally valuable. There may be some point at which you want students to do a speed drill, but frankly it is easier to give them a sheet of problems and use a stopwatch.

If students are going to think at all, they will need time. It is also helpful if the software supplies some way to help students solve the problem, using manipulatives or showing a running total so that students can adjust their strategies. *The Math Shop*, published by Scholastic New Media, is an example of software designed in this way. For instance, it allows students to make change, combine mixtures, or cut a length of wood into two pieces. It includes an untimed segment, in which students can explore, experiment, and consider strategies for solving the various problems presented. Students can also choose the timed game, which requires speed on their part. *The Math Shop* allows students to quit whenever they are done rather than require them to complete 15 problems at every level. Students accumulate a score that indicates the number of problems they have done correctly. *The Math Shop* comes in a junior version (Grades 1–4) and a regular version (Grades 4–8), as well as versions for teaching fractions and decimals, and weights and measures. All of these versions use the same format. For example, the format might present a problem in terms of serving customers at a shop in a mall and provide feedback about students' strategies as they assemble their answers.

Problem-Solving Software

Problem-solving software can be used with large groups by using a display monitor or with small groups at the computer. You can begin with a discussion of strategies for solving problems and then delineate a task for students to accomplish in small groups at the computer. The *Fizz and Martina Math Adventures* series, from Tom Snyder Productions, allows you to do this very easily. The problem-solving series from Sunburst Communications, including *The Factory Deluxe* and *Puzzle Tanks*, also provides outstanding opportunities for students think mathematically. I have used these software titles with graduate students, and they were impressed with the thinking required to solve these problems. Here is a screen from *Puzzle Tanks*.



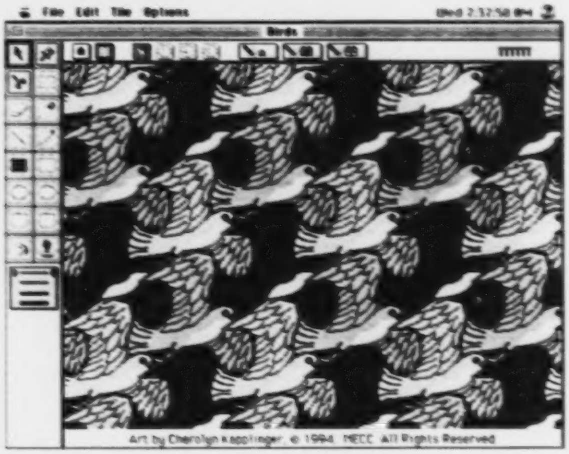
Spreadsheet Activities

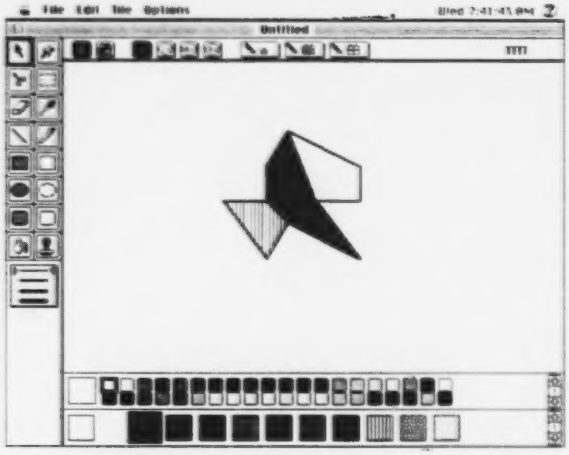
Spreadsheets provide a medium for organizing knowledge and making conjectures. For example, students can research the cost of a list of supermarket items at several different stores. They can track their own grades and figure out what would happen to their averages if they "aced" the next test. They can prepare a budget for a class party or trip, plot election returns across the country (great in a presidential election year), or use the spreadsheet to run a store in the classroom. (*Classroom StoreWorks*, from Tom Snyder Productions, is designed to do specifically this—it extends and improves on the *Little Shopper's Kit*.) *The Cruncher*, from Davidson & Associates, is designed to be a general-purpose spreadsheet program for young students. And, of course, *Microsoft Excel* works well for older students.

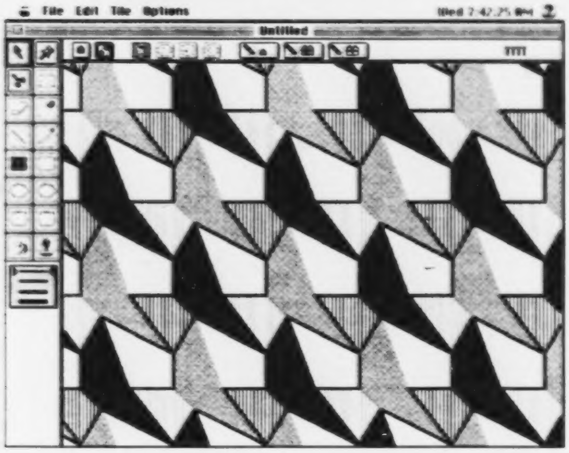
Exploring Mathematical Phenomena

I find it remarkable that we spend time reading to children and helping them become literate about books and stories, but we do not spend the same amount of time helping them to become "numerate." There are excellent pieces of software that help even very young children accomplish this. *Millie's Math House*, from Edmark, presents the value of a number kinesthetically, aurally, and visually. With all that scaffolding, young students can begin to conceptualize the number 2, for example, and understand its difference from the number 6. Like *Bailey's Book House*, discussed elsewhere in this chapter, *Millie's Math House* offers two levels for many of the activities. The first level is the introductory, exploratory level, and the second level presents challenges. If a student answers incorrectly, the program gradually reduces the choices until only the correct answer remains. Students are then congratulated as though they answered correctly the first time. This means they always can succeed.

Tesselmania!, from The Learning Company, illustrates how tessellations work and enables students to stretch, break up, and distort lines in a closed shape to create patterns of objects on the screen. Students can experiment with color, pattern, size, and shape to make visually appealing designs that illustrate mathematical relationships. The program is designed primarily for middle schoolers, but older students can also use it. Examples of some tessellations generated by the program are shown in the following illustrations.


File
Edit
Tile
Options
Wed 2:32:50 PM
Birds
Art by Cherolyn Kepplinger, © 1994, MECC All Rights Reserved





For older students, there are software packages that enable them to explore mathematical phenomena, e.g., graphing equations, calculating statistics, and discovering geometric relationships. Each of these software packages supplies tools to erect perpendiculars, compute the area of an enclosed figure, or sum a column of figures. The functions of the software may not be immediately apparent. You may feel slightly bewildered when the software presents a tool palette and waits for you or your students to do something. If this happens to you, find the manual. The geometry and algebra software from Logal Software, and two titles from Sunburst Communications—*Statistics Workshop* and *The Geometric superSupposer*—provide carefully written lessons that help you and your students understand what the software does and how it illustrates mathematical phenomena. Just as you would depend on a teacher's guide in any other subject to help you grasp the structure of the program, so too you will have to depend on the prepared lessons to help guide you in the use of the software. If you are previewing a software package of this sort, look carefully at the print materials that support computer work. They must be excellent so that students can work independently at the single computer in your classroom.

Other Features to Consider

When considering mathematics software, ask yourself the following questions: Must students shoot down aliens in order to do the drill-and-practice exercises? Does the software give a splashier response to a wrong answer than to a correct one? If the software keeps score, how does it display it for your use? And here is the most fundamental question of all: What does the computer add to this activity?

It is my personal position that space warfare has no place in mathematics instruction. You need not agree with me, but if you do, preview software carefully to avoid this drill-and-kill approach. Problem solving can be an immensely satisfying experience in and of itself, with a thrill of accomplishment that has nothing to do with zapping little green men. Yes, students, especially boys, like arcade game formats. But their prospective enjoyment is not sufficient reason to use a piece of software.

What about the way the software handles wrong answers? Does it help the student get the right answer or does it make such an interesting rude noise that getting the wrong answer is more appealing than getting the right answer? Check the software when you preview it and consider this question. Again, if the activity is even mildly useful, the sense of accomplishment should be sufficient and students should be given positive rewards for figuring it out.

Scores can be useful, provided that they give you some indication of your students' capabilities. Scores can even be an incentive. For example, students who serve 50 customers in *The Math Shop* can successfully move on to a different piece of software, or write story problems, or work with a student who needs help. But mathematics instruction should also be about understanding concepts, and many pieces of software that use scoring do not evaluate a student's understanding; they only keep count of correct answers. Again, preview carefully and decide whether the score-keeping function is well designed.

The most important question to ask about any software is whether the computer activity is worthwhile, whether the use of a computer provides some feature unavailable in other media. Timed speed-tests can be done with paper with pencil, unless the student has some physical disability that makes it difficult to write quickly. However, some graphing packages marshal so many valuable functions that they clearly represent a different, better way to teach. When you preview software, ask yourself what it does that could not be done as well, or perhaps at all, without a computer. Then ask yourself whether you can use the software to enrich and enhance your curriculum. The software may have great activities, but they may not have anything to do with what you planned to teach. Keep shopping until you find the software that helps you accomplish your educational agenda.

One Computer for Social Studies

The variety of software for social studies mirrors the multiple approaches to teaching. If you stress facts and dates, use drill-and-practice software activities and templates for customizing multiple-choice tests. If you take a more constructivist approach, you can use applications for creating concept maps and timelines. Along those same lines, an increasing number of primary-source collections are available, from which students can build their understanding of historic events and figures. Check the catalogs of educational software publishers and distributors listed in the Appendixes.

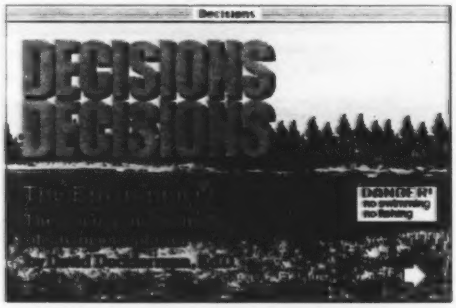
Decisions, Decisions

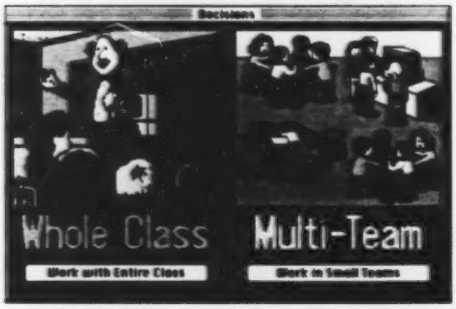
Game formats also can be educationally valuable in social studies. One particularly enduring format is *Decisions, Decisions* series, from Tom Snyder Productions. Its *World History Pack* includes software on ancient empires, feudalism, and building a nation. The *U.S. History Pack* addresses the issues of colonization, immigration, and revolutionary wars. Other titles include Environment, Violence in the Media, Urbanization, Foreign Policy, and Balancing the Budget. Another set of titles addresses social issues and includes Prejudice, Substance Abuse, AIDS, and Drinking and Driving.

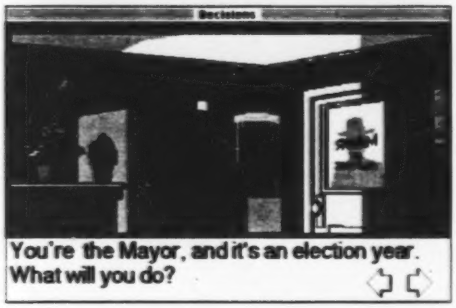
Decisions, Decisions is designed as a game to be played by several large teams. If a projection device is used, the whole class can participate. Each software title presents a problem or issue and gives the players responsibility for addressing the issue. For instance, the Environment title begins by describing the pollution caused by waste dumping in a local pond. Each team, acting as a mayor running for re-election, is forced to take action.

After the problem has been posed, each team sets its priorities. Is it most important to be re-elected, or to keep spending down, or to save the environment? The situation unfolds step by step as the players make decisions. However, these decisions are not made haphazardly. Each software package comes with booklets, usually four sets representing four different advisors with four different perspectives. As the game progresses, students use the reference material to become familiar with the concepts and then discuss the team's next move. Every move is judged by its effectiveness in accomplishing the team's priorities, and a final score is provided.

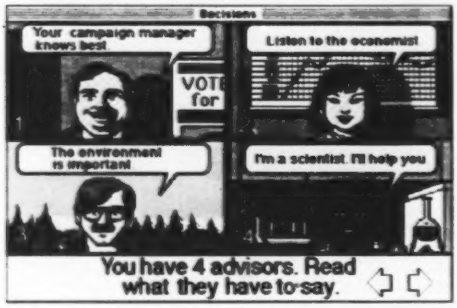
But the score is hardly the point. The software supports and scaffolds the students' understanding of the complex nature of social and historical issues. By documenting concepts and advisors' points of view, the software designers have enabled students to learn how to use information to make decisions. The game involves the whole class in discussions of values and consequences. The following set of illustrations from the program give an idea of the methods it uses.



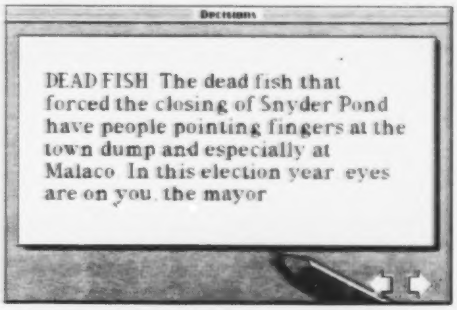




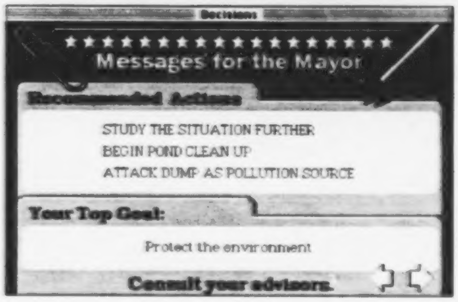
You're the Mayor, and it's an election year. What will you do?


Decisions
Your campaign manager knows best.
VOTE for
1
Listen to the economist
2
The environment is important
3
I'm a scientist. I'll help you
4

You have 4 advisors. Read what they have to say.



DEAD FISH The dead fish that forced the closing of Snyder Pond have people pointing fingers at the town dump and especially at Malaco In this election year eyes are on you, the mayor



STUDY THE SITUATION FURTHER
BEGIN POND CLEAN UP
ATTACK DUMP AS POLLUTION SOURCE

Protect the environment

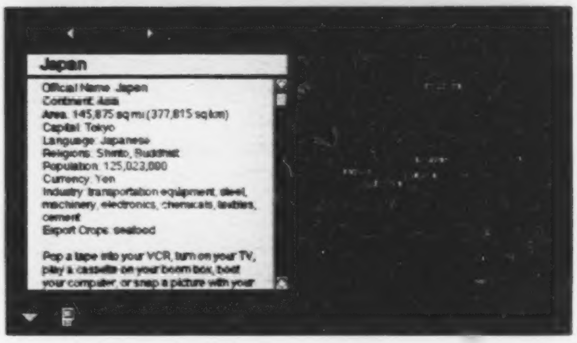
Decisions, Decisions, available in networked versions both for Macintosh computers and PCs, is advertised for Grades 4–12. The software requires reading activities while it is being used, so if you use a projection device to present the program, you may find yourself switching the lights on and off. *Decisions, Decisions* comes with extensive, detailed lesson plans and reproducible worksheets.

A version for younger students, *Choices, Choices*, addresses issues of environmental responsibility, individual responsibility, and peer relationships. Like *Decisions, Decisions*, the software is designed to help younger students understand the decision-making process and spark awareness of the consequences of their actions.

The Carmen Sandiego Series

Another game format that has endured the test of time is the *Where in the World Is Carmen Sandiego?* series, from Brøderbund Software. The premise of the game is that some object of value has been stolen from some museum by Carmen and her band of thieves, and the players are detectives who must use clues to ascertain the identity and destination of the criminal. There are game formats for world geography and U.S. geography, as well as a junior version. Each has a built-in database with information about countries and cultures, and there are dossiers on the individual thieves. The U.S. version comes with an almanac. To catch the thief, students use clues to follow the criminal from country to country or state to state, assembling enough information to obtain a warrant.

The format of the *Where in the World Is Carmen Sandiego?* series, like *Decisions, Decisions,* is consistent from game to game, allowing students to focus on the important material. They learn the material almost effortlessly because they need it to play and win the game. As they chase the thieves, they learn about languages, landmarks, mountains and rivers, monetary units, and flags. They also learn vocabulary as they gather clues to the thief's identity. The following illustrations give a representative sampling from the program.



Japan

Offical Name: Japan
Continent: Asia
Area: 145,875 sq mi (377,815 sq km)
Capital: Tokyo
Language: Japanese
Religions: Shinto, Buddhist
Population: 125,023,000
Currency: Yen
Industry: transportation equipment, steel, machinery, electronics, chemicals, textiles, cement
Export Crops: seafood

Pop a tape into your VCR, turn on your TV, play a cassette on your boom box, boot your computer, or snap a picture with your

In a one-computer classroom, you might introduce this game to the whole class and then send small groups of individuals to the computer to solve a limited number of cases during one turn. By requiring each group to bring back one fact about a flag, river, or landmark, you will help your students focus their attention on the information.

Simulated Trips

Simulated trips have proven to be a lasting format for social studies software. Several pieces from The Learning Company—*Oregon Trail, Amazon Trail, MayaQuest,* and *Africa Trail*—simulate the experience of travel, something you probably cannot otherwise do in your classroom. Students are introduced to the hazards and difficulties of these explorations and must make decisions in order to survive. They are also introduced to the history and science of each region within the game format. Tom Snyder Productions also has a travel game, *Geography Search*, that simulates an ocean voyage. *Crosscountry USA*, from VR Didatech Software, simulates a truck ride across America.

To play these games, students should probably go to the computer in pairs or trios, with a time limit. They will need to understand the importance of various kinds of travel supplies. You can discuss this before sending them to the computer, or let them discover the hard way what they should have taken. Understand that any discovery method takes time and requires repeated exposure to the software. Encourage your students to record their decisions about supplies and other items in their journals, and then discuss with the class the value of various supplies. I always play these games alone, and I have not yet survived a journey, an outcome that can be frustrating and counterproductive.

While social studies should not be entirely about the accumulation of information, some knowledge of facts is necessary. These game formats and simulations enable students to acquire information almost effortlessly as they run for office, chase villains, or struggle for survival.

Group Projects in Logo

Another use of one computer in a classroom is a group project in Logo. Remember Logo, the programming language that was supposed to revolutionize education? It is still a fascinating problem-solving environment in which students can explore mathematical relationships and powerful ideas. You may have heard of a new version of Logo called *MicroWorlds*. *MicroWorlds*, published by LCSI, is a hypermedia application that offers in a single program many of the appealing features seen in *Kid Pix, HyperStudio,* and *LogoWriter*. *LogoWriter* was the LCSI version of Logo that is now available only for Apple IIe and MS-DOS machines. If you use Logo with your students at all, here are some interesting projects to try with the class. If you do not use Logo, you might consider trying it.

The idea is to design a project in which individual students or small groups of students contribute pieces. I have a few ideas to suggest, but my list is hardly exhaustive.

An Alphabet Project

My favorite idea is the creation of an alphabet with individually designed letters. To create a letter, your students need not know more than PenUp, PenDown, Forward, Back, Right, Left, and how to define a procedure. One of the challenges, though, is that every letter starts with the turtle facing in a particular direction and may end with the turtle facing a different, perhaps unknown, direction. Therefore, a powerful idea is embedded in this activity, namely, the linking of subprocedures into a superprocedure so that the "seams" match. Your students eventually will have to consider this powerful idea so that they can use the alphabet to spell out words.

To begin, write the alphabet on the chalkboard and discuss the dimensions of the letters. Your students can decide approximately how big each letter should be, and they should plan their individual letters within those parameters. (A vertical limit of 40 turtle steps and a horizontal limit of 30 turtle steps works well, but the size is up to you and your class.) After deciding on the size, you can create a starting procedure called FRAME that draws an outline on the screen. This way, students can design their letters within the prescribed frame.

One of the findings of early research in Logo was that students' problem-solving skills were enhanced when they worked together (surprise, surprise). Thus, while you could have each student write one procedure for one letter, a better method is to have two or even three students write procedures together for three letters. That's where the letters on the chalkboard come in. Your students need to pick two or three letters that are related, for example, P and R (which is just a P with another line). If they choose intelligently, they can build on the first procedure to write the second one.

As student groups work on the computer, they take journal notes about the procedures just in case the computer is turned off before the procedures are saved. As each group defines letters, the list of defined words in the workspace gets longer. This is the advantage of working on one computer: all of the words end up in the same file, called, of course, Alphabet.

When students individually try to use the alphabet, they will have to take into account where to begin to draw each letter and how to orient the turtle. This is an excellent opportunity to teach Setpos or Setxy (depending on your implementation of Logo) and Setheading. Students can then use these to write their names so that the names slant down the screen or bounce across the screen.

I know that newer implementations of Logo have a Gprint command that lets you put letters on the graphics screen, but that removes all the fun and creativity. I am talking here about designed letters, with a little personality.

Other Projects

Another group project is to design a town, with buildings, trees, trucks or cars, signs, streets, and so forth. Again, most students need only the basics to get started, and you can divide the design tasks—one group can design a house, another group can design a tree, another group can design a truck, and so on. As with the alphabet, it is important to discuss scale so that you can limit, for example, the truck designers to lines shorter than 20 and the house builders to lines shorter than 50. Putting the pieces together will also involve Setpos or Setxy and Setheading. If a town doesn't appeal to your young programmers, how about a playground, a fantasy scene, or a classroom floor plan?

Another group project is to design things that might appear on a flag: solid stripes, stars of different sizes with various numbers of points, circles, leaves and flowers, shields, and so forth. If each group creates one thing, the class members can then choose from among these items to design their own flags, or they can re-create actual flags of states or countries.

Your groups essentially are creating their own tools. Tools accompany every version of Logo, but when students create their own tools, they understand both how they work and how they can be combined with other tools. This does not mean that every programming venture will proceed smoothly. Glitches will occur, and students will need help. This is where the "ask three before me" rule comes in handy so that you are not constantly interrupted. Instead, students can get help from the class "expert." Another approach is to set a time limit for each group and have students record in their journals any bugs they encounter. Logo will save buggy procedures, so students can think about them. Then during discussion, these bugs can be presented to the class for suggestions.

One last thought: Particular versions of Logo (*LogoWriter* and *MicroWorlds*, for example) can be used to write pages of a storybook for a younger student, with illustrations or stamps substituted for words. This is an ambitious project that will require some story planning before groups design their pages at the computer. When they are finished, you can write, with the entire class, the superprocedure that displays the story. This might even work for a choose-your-own-adventure activity, but the programming can get complicated.

Drawing Flowers With Logo

Another group project is to design a garden with a variety of flowers. The beauty of this project is that everyone's subprocedure can be incorporated into one picture of a garden in riotous bloom. Your students will have to be able to use Setpos to place their flowers and orient the turtle. They will want to be able to use colors and perhaps even patterns. (Striped or polka dot flowers can be fun.)

One important skill students will have to learn is to manipulate a procedure to draw an arc. Here is the procedure, derived from the formula for the circumference of a circle, $C = 2\pi r^2$. This procedure draws 10 degrees, or 1/36, of a circle—10 degrees of right turn, represented by two RT 5 turns.

```
To RARC :RADIUS
RT 5
FD :RADIUS *3.1416/18
RT 5
END
```

This procedure can be inserted in a REPEAT line, as in REPEAT 6[RARC 20]. This particular line will draw an arc (part of a circle) of 60 degrees, or one-sixth of a circle, and in this case the circle would have a radius of 20 if you drew the whole circle. After you have this arc procedure, you can write a procedure for a petal.

```
TO PETAL :RADIUS
REPEAT 6[RARC :RADIUS]
RT 120
REPEAT 6[RARC :RADIUS]
RT 120
END
```

If you do the math of the right turns, you will find that each REPEAT line draws 60 degrees of a circle and there are two of them, which adds up to 120. The procedure then calls for two more right turns of 120: altogether 360 degrees. You can vary the size by changing the radius and vary the shape by changing the number of repeats and degrees of right turns. Experiment with numbers as you go. If the right turns total 360, (the Total Turtle Trip), the turtle will begin and end with the same heading, and drawing multiple petals will be simple. Just draw a petal and turn, and draw a petal and turn, and draw a petal and turn, and so forth. You are again combining REPEATs, this time of petals and turns.

A different petal can be drawn using different numbers:

```
TO PETAL2 :RADIUS
REPEAT 9[RARC :RADIUS]
RT 90
REPEAT 9[RARC :RADIUS]
RT 90
END
```

Again, the numbers add up to 360, 90 degrees of right turns in each REPEAT line and two 90 degree turns. The figure closes and the turtle has made a total trip. What other combinations of numbers might draw pretty petals?

Flowers also need stems and leaves. Flowers can be fanciful, composed of geometric shapes rotated around a point instead of petals. The possibilities are endless, and all of them involve students in manipulating the Total Turtle Trip Theorem to complete the necessary rotations.

Another garden project involves defining shapes in the Shape table of *LogoWriter* or Logo Plus and then stamping them on a garden plot. Your students can plan a vegetable garden and lay it out on computer. This can be done in connection with a science lesson, and you can actually plant lettuce or another fast-growing plant if the weather is reliable. If you do not have a Shape table, your students can write procedures to draw tiny little vegetables, but this can become quite tedious.

Constellations and Quilts

Another group project related to science is a map of the sky, including constellations and planets. You can write a tiny star procedure and have your students research constellations. They can use Setpos to locate the stars on your star chart and even draw fine lines between them to define the constellations. You will have to decide whether the sky is a spring sky in the Northern Hemisphere or a winter sky in the Southern Hemisphere so that your students can draw constellations that actually do appear near one another. They can also research the mythical creatures that inspired the names of constellations. If you are into astrology, they can illustrate the signs of the zodiac.

Group projects in Logo are like quilts. In fact, your students can design a quilt. Each student or pair of students can design a block, perhaps measuring 30 turtle steps by 30 turtle steps. They can name their blocks with their own names, and then you can add a procedure that lifts the pen, moves to a position, sets the heading to zero, and puts the pen down. The superprocedure then only needs to call the procedure for a block, then for a move procedure, then another procedure for a block, and so forth. Of course, you can change quilt simply by varying the order of block procedures.

This approach divides the programming into smaller pieces and assigns those pieces to pairs or trios of students. It will become apparent to students that they will need to consider the state of the turtle after drawing one procedure and before calling the next procedure. This will become another interesting lesson they learn.

Inclusion in the One-Computer Classroom

One of the great benefits of using computers is that they can facilitate inclusion of students with disabilities. Frequently, students with disabilities come to a regular classroom with a computer. However, sometimes the student with disabilities will work alone at his or her computer, working alongside, but not with, other students. This may be necessary and even desirable sometimes, but it is not inclusion.

I have discussed elsewhere how students can do the same activity on a computer or away from a computer. Drawing, painting, math manipulatives, and word games all can be done with pencil and paper or with a computer. Research using an encyclopedia can take place on-computer or off-computer. Students with disabilities can do on a computer what the rest of the class members are doing at their seats. The computer may compensate for the lack of motor skills or sight in a student with disabilities.

The same criteria for selecting software apply for students with disabilities and without disabilities. Software meets these criteria if it demonstrates educational value, facilitates student performance, provides educational opportunities not otherwise available, and presents accurate and grammatically correct materials on well-organized screens.

However, for the student with disabilities there are some other criteria specific to the nature and extent of the disability. Publishing and drawing programs can enable these students to do a computer-based version of an art activity in the classroom. Games on computer can enable interaction and facilitate inclusion. Online resources enable students with physical disabilities to find information electronically. The screen organization is a critical issue for students with attention deficits, because messy, cluttered screens can distract these students and make it difficult for them to focus.

The issue of computer use by students with disabilities must be handled very sensitively by the classroom teacher. The rest of the class should not be made to feel that the student with disabilities is the only one who is allowed to use the computer. The purpose of inclusion is to provide interaction between students with and without disabilities, so choose activities that make this happen.

Elsewhere in this book I have described the essential characteristics of software for all students. It should handle student errors helpfully, enable students to navigate easily, provide clear and adequate on-screen information, teach rather than test, present multisensory formats, and facilitate students' work. Software for use with students with disabilities should have all these characteristics, too. The software must facilitate these students' work, enabling them to do what they could not do otherwise. Moreover, software for this population must provide an educational experience equivalent to the off-computer activities of other students. Writing, drawing, and painting software makes it possible for students with motor impairments to express themselves in words and pictures, as students who can use pencils, crayons, and paintbrushes do. Puzzle software can give students with disabilities the opportunity to hone their language skills by doing crossword puzzles and word searches on the computer.

Enabling Interaction Between Students

Software can provide opportunities for students with and without disabilities to play and learn together, which is what inclusion really means. Games on computers obviate the need for physical coordination; any student who can control a mouse can play chess, checkers, or Mankala. Games like *Where in the World Is Carmen Sandiego?* offer an opportunity for students to collaborate to solve a mystery and catch a criminal. *The Graph Club* makes it possible for students to conduct a survey of their classmates and enter data to create a variety of graphs. The scaffolding that this software provides for students without disabilities is even more valuable for students with disabilities.

Reading CD-ROM storybooks does not require physical dexterity and is therefore well suited for students whose mobility is compromised. Doing research in printed encyclopedias and atlases can be difficult for a student who is paralyzed, but if he or she can control a mouse, this research can be done on a computer. Adaptive devices have been created for students with physical disabilities, enabling them to control a mouse by using only a puff of air.

Attention Deficit and Hyperactivity

I have discussed the possibility of using a computer to equalize educational opportunities for students with physical disabilities. But what can a computer provide for a student who has an attention deficit hyperactivity disorder? Several of my graduate students are doing research on ADHD students and their interaction with computer software. Their research is aimed at trying to determine whether and under what circumstances computers provide support for these students when they are included in regular classrooms. My graduate students begin with several observations about the "fit" between ADHD and computer software design. It seems likely that earphones will help students focus on the computer task by putting the sound directly in the student's ears. The color and movement of software may engage a student's attention more completely than textbooks. On the other hand, perhaps too much noise and movement will distract these students. My graduate students plan to observe students using a variety of software designs to ascertain which features seem helpful and which seem disruptive.

If you have students with this disorder in your classroom, watch them as they interact with software and try to identify the characteristics of programs that seem to be particularly successful. Look for clearly designed screens and for consistent placement and wording of prompts. A well-designed piece of software will also demand a consistent format for responses from the student. Choose software that is well organized, especially for this population.

Inclusion frequently involves a student whose intellectual abilities are significantly lower than those of the rest of the class. For this student, the intent is to provide models of "normal," socially appropriate behavior. In these instances it may still be possible to create opportunities for collaboration at the computer. This student can help make a sign or banner in *Print Shop Deluxe* or a cover for a book from a drawing program. Because the computer provides the common ground on which the product is created, students may be able to work together more easily than with paper and pencil.

A computer in the classroom can enable students to work together to create a product, solve a problem, and play a game. When a student with disabilities is included in this activity, all students learn about one another's strengths and weaknesses and develop strategies that allows everyone to succeed.

Conclusion

I hope this book provides you with ideas and strategies for using one computer in your classroom. I am aware that some sections discuss obsolete hardware and software, but we must all remember that most schools do not have the newest version of everything, and that some oldies are goodies. What seems obsolete to some of us may be vital to others.

Do not despair if you have an older computer or older versions of software. There are valuable activities you can carry out with any technology you have.

After you begin using the computer in your classroom, you will create your own ideas and strategies. Please share them with me for the next edition of this book. If you have comments or suggestions, do not hesitate to e-mail them to me at jkahn@mciunix.mciu.k12.pa.us. I look forward to hearing from you.

References

Bruner, J. (1978). The role of dialogue in language acquisition. In A. Sinclair, R. Jarvelle, & W. Levelt (Eds.), *The child's conception of language* (pp. 241–256). New York: Springer-Verlagg.

Cochran-Smith, M., Paris, C., & Kahn, J. (1991). *Learning to write differently*. Norwood, NJ: Ablex Books.

Dockterman, D. (1997). *Great teaching in the one-computer classroom*. Tom Snyder Productions.

Hinton, S.E. (1967). *The outsiders*. New York: Viking Books.

Kahn, J. (1987). Learning to write with a new tool. *The Computing Teacher, 14*(9).

Papert, S. (1980). *Mindstorms*. New York: Basic Books.

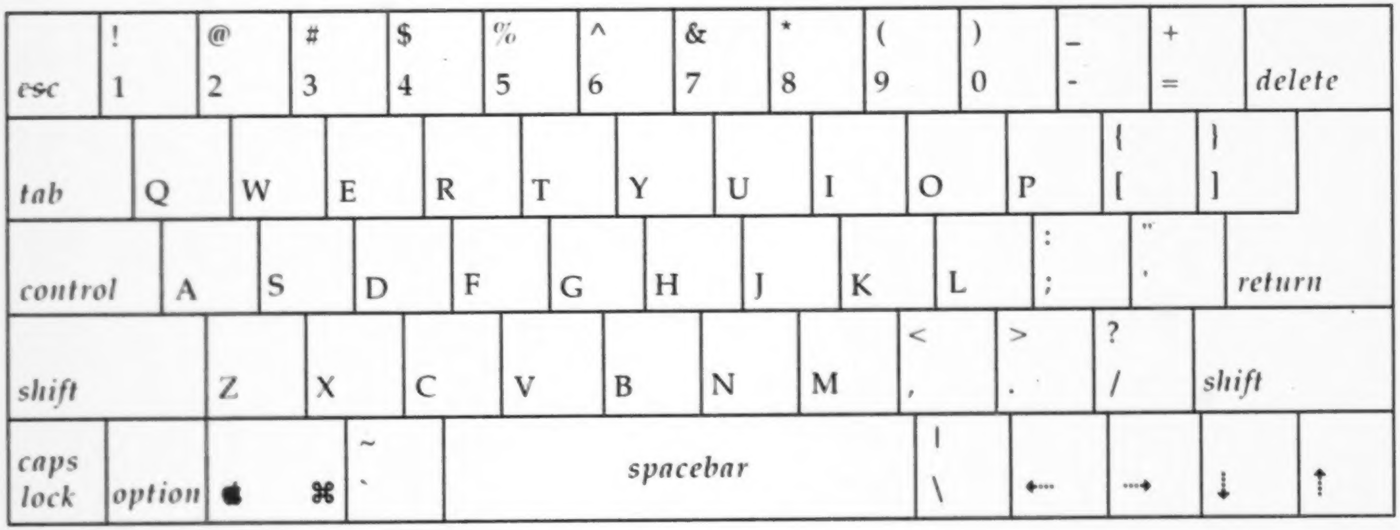
Paulos, J. (1990). *Innumeracy*. New York: Vintage Books.

Postman, N., & Weingartner, C. (1969). *Teaching as a subversive activity*. New York: Delacourt Press.

Smith, F. (1996). *Reading without nonsense*. New York: Teachers College Press.

Appendixes

Sample Keyboard



Worksheet

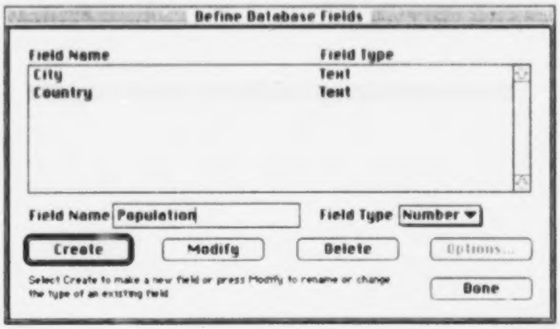
Creating a ClarisWorks Database

Here are brief instructions for creating a database students can use to record the books they have read. The database might have a popup menu that has only two options—fiction and nonfiction. It might have a value list following the popup menu in which the genre, or type of book, is specified. A checkbox can be used to indicate (yes or no) whether a movie has been made from the book. The database, of course, could also have fields for title, author, number of pages, and so forth. Students can even design a rating system and include a field for it, or they can simply include a field for comments and the initials or name of the person making a comment.

After students have assembled the database, they can search it for books by a particular author, books of a particular genre, books less than 100 pages long, or books fulfilling other criteria. They also might look to see which books got five-star ratings or have the word "exciting" in the comment fields.

This database activity works particularly well in a one-computer classroom!

1. Open *ClarisWorks*. When the New Document dialog box appears, select Database and click OK.
2. When the new document has opened, the Define Database Fields dialog box appears. Type in the name of the field you would like to create and select the field type. The most common are Text and Number; the following sections give instructions for creating other types. Click Create. Continue adding fields and click Done when you are finished. The following figure shows the Define Database Fields dialog box.



Field Name	Field Type
City	Text
Country	Text

Field Name: Population
Field Type: Number

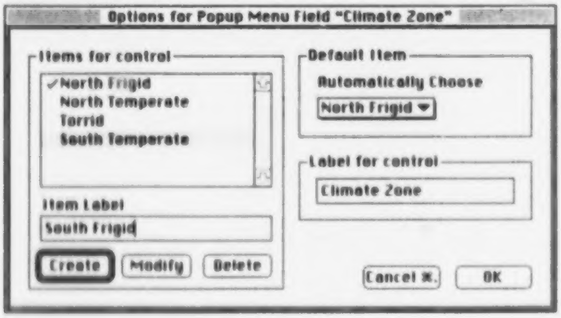
Select Create to make a new field or press Modify to rename or change the type of an existing field

3. Begin entering data. Use the Tab key to move to the next field or record.

Creating Special Fields

Popup Menus

1. Open the Define Fields dialog box.
2. Type the field name and select Popup Menu as the field type. Click Create.
3. The Options dialog box appears. Type the categories of data you want to appear in the menu. Click Create after each category.
4. You can choose the default category for fields for which no value is selected by entering it in the Default Item box in the upper right corner of the dialog box.
5. Click OK when you are finished. The following figure shows the Popup Menu Field "Climate Zone" dialog box.



Options for Popup Menu Field "Climate Zone"

Items for control

✓North Frigid
North Temperate
Torrid
South Temperate

Item Label: South Frigid

Default Item

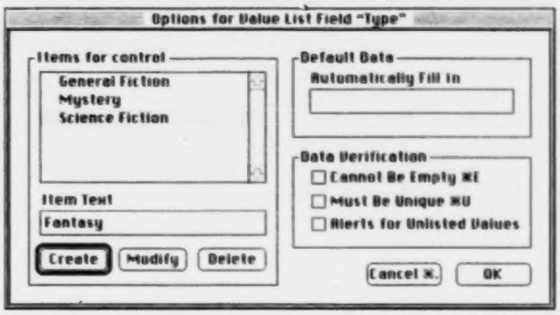
Automatically Choose: North Frigid

Label for control: Climate Zone

Value Lists

1. Create a new field and select Value List as the field type.
2. The Options dialog box appears. Type the values that can be selected.

3. You can choose whether database users can leave the value-list field blank and whether an alert box will appear when users type in information not contained in the value list. The following figure shows the Value List Field "Type" dialog box.



Options for Value List Field "Type"

Items for control

General Fiction
Mystery
Science Fiction

Item Text: Fantasy

Default Data

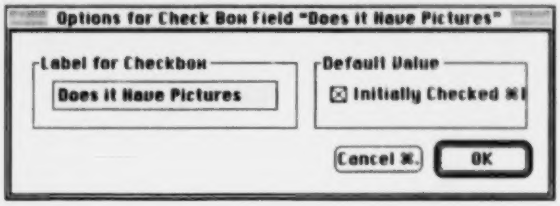
Automatically Fill In

Data Verification

☐ Cannot Be Empty ⌘E
☐ Must Be Unique ⌘U
☐ Alerts for Unlisted Values

Checkboxes

1. Create a new field and choose Checkbox as the field type.
2. Click Options.
3. You can relabel the field and choose whether the box should be checked when a new database record is first entered. The next figure shows the Checkbox Field dialog box.



Options for Check Box Field "Does it Have Pictures"

Label for Checkbox: Does it Have Pictures

Default Value

☒ Initially Checked ⌘I

Software Packages

Product	Publisher	Hardware	Annotation	Grade Level
A.D.A.M. Essentials	A.D.A.M. Software	Mac-CD, Win-CD	Covers major body structures, how they connect, how they work together; has a comprehensive database and animated anatomical presentations	7–12 & Teacher
A.D.A.M. The Inside Story	A.D.A.M. Software	Mac-CD, Win-CD	Covers major body structures, how they connect, how they work together; designed for younger students	4–9
Africa Trail	The Learning Company	Mac, Win, Mac/Win-CD	Students join a bicycle trek through Africa; based on the 1992 expedition; simulation involving decision making, problem solving, and cooperative learning	4–12
Amazon Trail, The	The Learning Company	Mac, PC, Win, Mac/ Win-CD	In a simulation of a trip up the Amazon in search of a cure for malaria, students meet historical figures and explore the rain forest environment	4–9
America Online	America Online	Mac, Win, Mac-CD, Win-CD	Communication software (e-mail) for America Online subscribers	3–12 & Teacher
AppleWorks	Scantron Quality Computers	Apple II	Integrated word processor, spreadsheet, and database	K–12 & Teacher

Bailey's Book House	Edmark	Mac, PC, Mac/Win-CD	Activities help children develop prereading skills, categorize groups of pictures, write a creative short story, and explore rhymes	Pre-K–3
Children's Writing & Publishing Center	The Learning Company	Apple, PC	Student writing activities combined with desktop publishing	1–9
Choices, Choices: Kids and the Environment	Tom Snyder Productions	Apple, Mac, PC, Win, Mac/Win-CD	Students work cooperatively to make environmental decisions based on presented situations	1–6
Choices, Choices: On the Playground	Tom Snyder Productions	Apple, Mac, PC, Win, Mac/Win-CD	Students make choices about a troubled school friend	1–6
Choices, Choices: Taking Responsibility	Tom Snyder Productions	Apple, Mac, PC, Win, Mac/Win-CD	Students develop valuable critical thinking skills as they make decisions in a familiar real-life situation containing difficult choices	1–6
Chronicle, The	Sunburst Communications	Mac	Students choose a time scale (from seconds to years) that best displays relationships between events, then add events using movies, graphics, sounds, and text passages	4–12
ClarisWorks	Apple Education	Mac, Power Mac, Win 95	Full-featured and well-integrated; contains word processor, database, spreadsheet, graphics, and telecommunications	7–12 & Teacher
Claris Emailer	Apple Education	Mac, Win	E-mail software including automated mail management, multimedia file attachment capability, and spell checker	3–12 & Teacher
Classroom StoreWorks	Tom Snyder	Mac, Win	Students apply and practice math skills as they turn their classroom into a store; optional money kit to support math experiences also available	1–6

Classroom Toolbox	Sunburst Communications	Apple II	Generates free-form tests, including reading comprehension paragraphs or a variety of puzzles, including multiple-choice, word scrambles, matching, crosswords, and true/false	1–12 & Teacher
Creative Writer	Microsoft Corporation	Mac, Win	Motivational word processor/desktop publisher tool; has cartoon characters to guide students' writing process and stimulate creativity	4–9
Crosscountry USA	VR Didatech Software	Apple, Mac, PC, Mac/PC-CD	Simulated journey combines map reading, decision-making skills, and geography of the United States; utilizes reference materials	4–9
Crossword Studio	Forest Technologies	Mac, Win, Mac/Win-CD	Creates crossword puzzles, allows you full control over the position of the puzzle, the clues, and the graphic elements	K–12 & Teacher
Cruncher, The	Davidson & Associates	Mac, Win, Mac/Win-CD	Full spreadsheet with simple tutorials and interesting problems; numerous classroom templates	4–12
CU-SeeMe	White Pine Software	Power Mac, Win 95	Internet video chat software with color, video, audio, typed text, and data communication; requires video camera	4–12 & Teacher
Decisions, Decisions (Series)	Tom Snyder Productions	Mac, Win	In each title in the series, students role-play a decision maker faced with a critical situation drawn right from history or contemporary issues curriculum	4–12
Easy Book	Sunburst Communications	Mac, Win	Easy tool for young children to create and print books	1–6
Eudora Pro	Qualcomm	Mac, Win	An e-mail utility	1–12
Expression	Sunburst Communications	Mac, Win	This writing tool helps students to organize ideas and express content in a clear and orderly manner in a graphic web	4–12
Factory Deluxe, The	Sunburst Communications	Apple, Mac, PC, Win, Mac-CD	Practice visual discrimination, spatial perception, sequencing, and ordering skills	4–8

Field Trip to the Rainforest	Sunburst Communications	Apple, Mac, Win	Introduces students to the diversity of life in the Kelp forest and rocky shore habitat; includes a Field Guide, Organism Data Table, and Food Chain activity for 76 plants and animals	2–10
Fizz and Martina Math Adventures (Series)	Tom Snyder Productions	Mac/Win-CD	In each of the three programs, students watch a story that presents math problems in context and work in teams to solve problems; available in video and CD-ROM versions	1–6
FoolProof	Smartstuff Software	Mac, Win	A utility to safeguard the desktop controls from student modification	9–12 & Teacher
Geography Search	Tom Snyder Productions	Mac, Win, Mac/Win-CD	Students learn how to use the stars and sun to determine latitude and longitude as they travel to a new world	4–12
Geometric superSupposer, The	Sunburst Communications	Mac, PC	Students perform constructions on several shapes, view them in the graph history window, and use the Geometer's Spreadsheet to analyze data from present and previous cases	6–12
Graph Club, The	Tom Snyder Productions	eMate, Mac, Win	Students can graph using picto-, bar, and circle graphs; has sound; also a Spanish version	1–6
If Your Name Was Changed at Ellis Island	Scholastic Press	Mac-CD	Hear stories of people's trips through Ellis Island, meet famous immigrants and today's immigrant children, explore Ellis Island, and analyze and use maps and graphs	3–8
Inspiration	Inspiration Software	Mac, Win	Brainstorm and organize ideas in a linear outline or visual form; converts from one style to the other	7–12 & Teacher
Kid Phonics	Davidson & Associates	Mac/Power Mac/Win/ Win 95-CD	Early childhood prereading activities to provide the auditory experiences needed to progress from hearing sounds to reading words	Pre-K–6

Logo	Logo Foundation		For information on all versions of Logo, including some free ones, contact the Logo Foundation, 250 West 85th Street, Suite 4D, New York, NY 10029; phone: 212-579-8028; fax: 212-579-8013; URL: http://lcs.www.media.mit.edu	
LogoWriter	Logo Computer Systems Incorporated	Apple II, PC	Drawing, writing, and problem-solving tool; Logo programming language	1–12 & Teacher
Math Blaster (Series)	Davidson & Associates	Mac/Win/ Win 95-CD	Drill-and-practice in an engaging format; lots of levels available to provide flexibility; all skills addressed	4–9
Math Shop Jr.	Scholastic New Media	Apple II, Mac, PC	Students use their beginning math skills in shopping simulations	1–4
Math Shop, The	Scholastic New Media	Apple II, Mac, PC	Students help the proprietors with their math problems: inventory, sales, etc.	4–8
MayaQuest	The Learning Company	Mac, Win, Mac/Win-CD	Students develop decision-making, problem-solving, and cooperative-learning skills as they travel with an anthropological expedition through Yucatan and ancient Mayan civilizations	4–12
Microsoft Excel	Microsoft Corporation	Mac, Win	Full-function spreadsheet with graphics	9–12 & Teacher
Microsoft Internet Explorer	Microsoft Corporation	Mac, Win	World Wide Web browser	1–12 & Teacher
Microsoft Office	Microsoft Corporation	Mac-CD, Win 95-CD	A bundled set of productivity tools: Word, Excel, PowerPoint, and Access; requires large amount of RAM	7–12 & Teacher
Microsoft Word	Microsoft Corporation	Mac, PC, Win	Full-function word processor; can be used for desktop publishing	7–12 & Teacher
Microsoft Works	Microsoft Corporation	Mac, PC, Win	Word processor, database, spreadsheet, graphics, and telecommunications	4–12 & Teacher
MicroWorlds	LCSI	Mac, PC	Embedded in a Logo environment are numerous project activities for students to combine text, graphics, music, and animation	4–9

Mighty Math: Carnival Countdown	Edmark	Mac/Win-CD	In the fun park, five activities encourage students to grasp number concepts and build important early math skills	1–3
Millie's Math House	Edmark	Mac, PC, Mac/Win-CD	Students explore fundamental math concepts, such as counting and classification, in six different activities through discovery or posed problems	Pre-K–3
Music Shop	Oplode Systems	Mac, Win	Transcribes notes played on a keyboard and plays the notes back on a variety of instruments, in different keys, and at different tempos; works with MIDI interface	4–12 & Teacher
My Own Stories	The Learning Company	Mac, PC	A writing tool that sparks students' creative writing by providing images, scenery, colors, sounds, songs, borders, and different fonts	1–9
Netscape Navigator	Netscape Communications	Mac, Win	The major World Wide Web browser; download from the Internet	1–12 & Teacher
Oregon Trail, The	The Learning Company	Apple II, Mac, PC, Win	Improved version of Oregon Trail; simulates the 1850 trek west in a covered wagon	4–9
Print Shop Deluxe	Brøderbund Software	Mac, PC, Win	Students combine graphics and text to create greeting cards, signs, stationery, calendars, banners, and more	1–12 & Teacher
Print Shop Deluxe CD Ensemble I or II	Brøderbund Software	Mac-CD, Win-CD	Most extensive version yet of the Print Shop with extra graphics and a wide range of printing possibilities	1–12 & Teacher
Puzzle Power	Centron	Mac-CD, Win-CD	Creates crosswords, word searches, and nine more types of puzzles; provides pictures, sounds, and movies for all puzzle types	1–12 & Teacher
Puzzle Tanks	Sunburst Communications	Apple II, Mac, PC, Win	Practice math and logic skills by filling a large tank from a number of smaller tanks	4–9

Reading Galaxy—Featuring the Alien Tales Game Show	Brøderbund Software	Mac, Win	Excerpts and synopses from 30 favorite works of children's literature, biographical information about each author, and an interstellar game to outsmart a panel of Alien Guest Celebrities	1–6
Statistics Workshop	Sunburst Communications	Mac	Students can enter data, create several types of graphs, and generate and analyze resultant statistics	7–12 & Teacher
TesselMania!	The Learning Company	Mac, Win	Students explore transformational geometry while they create their own tessellations (interlocking, puzzle-like designs); inspired by the artwork of M.C. Escher	4–12 & Teacher
TesselMania! Deluxe	The Learning Company	Mac/Win-CD	Expanded version of TesselMania! has an animated character to guide students; contains more ways to create tessellations and additional projects like posters, banners, T-shirts, 3-D objects, and puzzles	4–12 & Teacher
Timeliner 4.0	Tom Snyder Productions	eMate, Mac, Win, Mac/Win-CD	Produces printed chronology of historical events, students' lives, etc.	4–12 & Teacher
Voices of the '30s	Sunburst Communications	Mac-CD	Exploration of music, movies, sound clips, photography, and text of the 1930s in a framework of the writings of John Steinbeck	4–12
Way Things Work, The	DK Multimedia	Mac/Power Mac/Win-CD	Based on the David Macauley book; animations and audio explain the workings of many technologies; includes a selection of inventors and scientists; has built-in connection to the Internet	4–12
WebWacker	Forefront Group	Mac, Power Mac, Win, Win 95	A tool that allows students to visit Web sites without an Internet connection; the sites are captured in advance and grouped together for student use	9–12 & Teacher
What's the Story?	Logal Software	Mac, Win	Game format for building reading skills	3–5

Where in the USA Is Carmen Sandiego?	Brøderbund Software	Mac/Win-CD	Students follow clues and use Fodor's USA Travel Guide to capture Carmen	4–12
Where in the World Is Carmen Sandiego?	Brøderbund Software	Mac/Power Mac/Win-CD	Use the World Almanac to search the world and capture Carmen	4–12
Where in the World Is Carmen Sandiego? Jr.	Brøderbund Software	Mac/Win-CD	A simplified version of the geography game for younger students	1–6
Where in Time Is Carmen Sandiego?	Brøderbund Software	Mac/Win-CD	Covers 1,500 years of world history as players travel through time to capture Carmen	4–12
Word Attack 3	Davidson & Associates	Mac, PC, Mac/PC-CD	Through five activities, students learn definitions and spelling of more than 3,200 words	4–9
WordPlay	Educational Activities, Inc.	Mac, Win	Create five types of puzzles, with answer keys, from word lists; puzzles can be created in a variety of languages	1–12 & Teacher
Worksheet Magic	Teacher Support Software	Mac, PC, Win	Create worksheets in more than 60 different formats including crossword puzzles, word searches, multiple choice, fill in the blank, etc.	K–12 & Teacher
Writing Center, The	The Learning Company	Mac, Mac-CD	Student writing activities combined with desktop publishing; includes color picture library	1–12 & Teacher

Software Publishers and Other Resources

A.D.A.M. Software
1600 RiverEdge Parkway, Suite 800
Atlanta, GA 30328
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800-755-2326
Fax: 770-955-3088
http://www.adam.com

America Online
703-893-6288
800-827-6364
Fax: 800-827-5551

Apple Computer, Inc.
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http://www.apple.com

Apple Education
408-987-3022
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Fax: 408-987-7105

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http://www.ForestTech.com

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800-877-4292
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http://www.inspiration.com

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http://www.lcsi.ca

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800-685-6322
Fax: 612-569-1551
http://www.learningco.com

LOGAL Software Inc.
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Cambridge, MA 02140
617-491-4440
800-564-2587
Fax: 617-491-5855
http://www.logal.com

Microsoft Corporation
Order from a national educational software distributor
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Netscape Communications
Download from Web site
http://www.netscape.com

Oplode Systems
3950 Fabian Way, Suite 100
Palo Alto, CA 94303
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San Diego, CA 92121-2776
619-450-9681
http://www.qualcomm.com

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St. Clair Shores, MI 48080
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http://www.thelinq.net

Scholastic New Media
PO Box 7502
Jefferson City, MO 65102
212-505-3130
800-541-5513
Fax: 314-635-5881
http://www.scholastic.com

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http://www.tssoftware.com

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Nashua, NH 03063
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800-241-7463
Fax: 603-886-9051
http://www.cuseeme.com

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Fax: 520-772-5929

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Dewey, AZ 86327
520-772-7111
800-531-3227
Fax: 800-441-5015

Cambridge Development Laboratory, Inc.
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617-890-4640
800-637-0047
Fax: 617-890-2894

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Leesburg, VA 20175
703-777-9110
800-543-8188
Fax: 703-777-3871

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Sunnyvale, CA 94089
408-734-0524
800-446-3713
Fax: 408-734-1943

Educational Resources
1550 Executive Dr.
PO Box 1900
Elgin, IL 60121-1900
847-888-8300
800-624-2926
Fax: 847-888-8499

Educational Software Institute (ESI)
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Omaha, NE 68127
402-592-3300
800-955-5570
Fax: 402-592-2017

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Elmsford, NY 10523
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Fax: 914-347-0217

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Springfield, OH 45504
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800-622-1000
Fax: 937-443-2260

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Fax: 206-322-7421

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Fax: 541-744-2056

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800-777-3642
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800-247-1603
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